Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.Tech (BT)/SEM-4/BT-403/2010

2010

MOLECULAR BIOLOGY AND *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) Gratuitous inducer for lac operon is

a) Glucose b) Lactose

c) IPTG d) Allolactose.

ii) Transcription is the

a) synthesis of RNA with DNA as a template

b) synthesis of protein with RNA as messenger

c) synthesis of protein from DNA

d) synthesis of a complementary DNA strand to an RNA.

iii) Ribozyme is

a) ribosomal RNA

b) catalytic RNA

c) type of lysozyme

d) RNA polymerase.

iv) Methylase can

a) protect DNA from endonuclease

b) join two DNA fragments

c) help to propagate Ti plasmid

d) help in reverse transcription.

v) Annealing temperature in PCR is

a) 94°C b) 54°C

c) 72°C d) 37°C.

vi) Transcription in animal cells takes place

a) in the cytoplasm only

b) in the nucleolus only

c) in the nucleus and the mitochondrion

d) in the nucleus only.

vii) The continuous backbone chain of any nucleic acid (DNA or RNA) contains which of the following atoms ?

a) Carbon, nitrogen and oxygen

b) Carbon, oxygen and sulphur

c) Carbon, nitrogen and phosphorus

d) Carbon, oxygen and phosphorus.

viii) SV40 is a

a) phage virus

b) plant virus

c) animal virus

d) none of these.

ix) Which of the following is *not* required for transcription *in vivo* ?

a) Nucleic acid

b) A primer

c) CTP

d) A polymerase.

x) The connections between the sugar moieties found in RNA and DNA involve which of the following carbon atoms ?

a) 2 and 3 b) 1 and 5

c) 2 and 4 d) 3 and 5.

xi) Muscle, skin, liver cells differ from each other due to

a) different mutations arisen in each cell type

b) different expression of genes in each cell type

c) different genes present in different cell types

d) different location of cell types in the organism.

xii) Automatic sequencing is based on

a) the utilisation of fluorescent labelling

b) the utilisation of four types of dideoxynucleotide

c) the utilisation of DNA polymerases

d) all of these.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. 3 × 5 = 15

2. What are post transcriptional modifications ? Define alternative splicing mechanism. 3 + 2

3. Ribosome has 3 folding sites for *t*RNA. Explain.

4. Write one function of the following :

   a) Topoisomerase

   b) Shine Delgarno Sequence

   c) COS site of a COSMID. 1 + 2 + 2

5. What is the difference between RNAi and Sh RNA ? Give one use each. 3 + 2

6. What is Northern Blotting ? How is it different from Western Blotting ? Which is easier to do the laboratory ? 2 + 2 + 1

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. 3 × 15 = 45

7. a) What are genome and genomic library ?

   b) Describe the purification of poly(A) mRNA and non-poly(A) mRNA (with diagram).

   c) Describe with diagram the general procedure of *ds c*DNA synthesis.

   d) The rarest *m*RNA in a cell of a particular type has a concentration of five molecules per cell. Each cell contains 450,000 *m*RNA molecules. A *c*DNA library is made from *m*RNA isolated from this tissue. How many clones will need to screened to have a 99% probability of finding at least one reconbinant containing a *c*DNA copy of rarest *m*RNA ? 2 + 4 + 4 + 5

8. Define an operon ? What are positive and negative regulations ? Differentiate between repression and Induction with the example of Ara and Lac operon. 2 + 4 + 6 + 3

9. What is the difference between RT PCR and Multiplex PCR ? How is RT PCR used in the Diagnostics of HIV ? Discuss the procedure to standardize the melting curve of Primers. Explain the Fluorescence and probe methods in RT PCR. 3 + 2 + 5 + 5

10. Diagrammatically represent the DNA fingerprinting process ? If the bands in question do not match the band of the suspects or it is in the middle of the two bands of the suspects what are the possibilities ? How can this technology be used in developing unique identification codes ? 6 + 5 + 4

11. What is cot value and importance of cot curve ? Define the reaction order of re-association kinetics of single stranded DNA in cot analysis ? What is fold back DNA ? Draw the re-naturation curve of a repeat sequence which accounts for 10% of total DNA and there are 6 copies of it. 3 + 5 + 3 + 4