

Name : .....

Roll No. : .....

Invigilator's Signature : .....

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

**MOLECULAR BIOLOGY AND 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) Gratuitous inducer for lac operon is

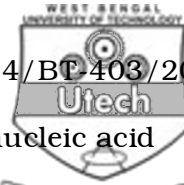
- a) Glucose                      b) Lactose  
c) IPTG                         d) Allolactose.

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 ?

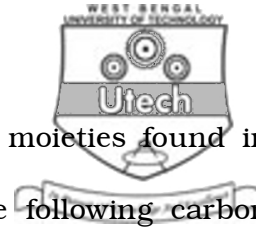
- a) Carbon, nitrogen and oxygen
- b) Carbon, oxygen and sulphur
- c) Carbon, nitrogen and phosphorus
- d) Carbon, oxygen and phosphorus.

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.  $3 \times 5 = 15$

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.  $3 \times 15 = 45$

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

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