Total number of printed pages – 7 B. Tech
CPBT 7204

## Fourth Semester Examination – 2008 MOLECULAR BIOLOGY

Full Marks - 70

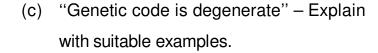
Time: 3 Hours

Answer Question No. 1 which is compulsory and any five from the rest.

The figures in the right-hand margin indicate marks.

- Answer the following questions: 2 ×10
  - (a) What is Shine Dalgarno Sequence?
    Mention the function of this sequence during translation.
  - (b) What is the function of Alkaline Phophatase and Taq DNA polymerase in molecular biology?

P.T.O.



- (d) An *Hind-III enzyme* has cleaved a genomic DNA of  $4.32 \times 10^3$  bp by incubating at 37 °C for 2 hours. The GC content of the genome is 50%. Calculate the frequency of restriction cleavage and number of restriction fragments generated at the end of this experiment assuming it a complete digestion.
- (e) Differentiate between 'rho-dependent' and 'rho-independent' termination of transcription.
- (f) How many number of targeted DNA fragment will be generated by using PCR amplification of 30 cycles, where the initial copy number of template DNA is 6 × 10<sup>6</sup> and mean efficiency of PCR is 90%?

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All India entrance exam question paper modal paper guesses paper and mock test

- (g) Why DNA is known as the genetic material? Name two evidences deliberated to show DNA is the genetic material.
- (h) An oligo-nucleotide probe of 50 bp length and 54% GC content was synthesized using a DNA synthesizer. The post synthesis optical density measurement of probe was 1.082 at 260 nm. Calculate the oligonucleotide concentration of the probe.
- (i) Transcription and translations are coupled in prokaryotes, but not in eukaryotes – explain the reason thereof.
- (j) Define 'Tm' of DNA. Calculate the 'Tm' of a 15-mer primer containing 40% GC content.

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- (a) What do you mean by c-DNA and how
  it differs from genomic DNA? Briefly
  explain the various approaches used to
  generate c-DNA molecule during construction of C-DNA library. 2+5
  - (b) How many number of c-DNA clone is required for 99% coverage of the genome, if the cloning vector is BAC and genome size is  $6 \times 10^6$  mbp.
- 3. What is Transcription? Briefly explain the process of transcription in eukaryotes and add a note on transcription factor II-D (TFII-D).

1+6+3

4. (a) Briefly explain the Sanger's method of DNA sequencing. How this method was automated for the sequencing of sub-genomic YAC clones? 4+2

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(b) The following is a part outcome autoradiogram of Maxam and Gilberts sequencing experiment. During the experiment the radioisotope labelled with 5' end. What is the sequence including polarity of the SS-DNA that served as template for generating this pattern.



5. (a) Briefly explain the methods of nucleic acid hybridization. Add a note on the stringency of hybridization.

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- (b) Define genome complexity. Narrate the genome composition of human with note on repetitive DNA.
- 6. (a) Briefly explain the properties and mode of action of Restriction-modification system-II and justify the importance of Restriction endonuclease-II enzyme in recombinant DNA experiments.
  - (b) A circular plasmid DNA molecule of size 10.5 Kbp is digested with restriction endonucleases *Eco R-I*, *Hind-III* and *BamH-I*, singly and in all possible combinations. Linear restriction fragments of following sizes are generated:

<u>Enzymes</u>	Fragment size in kbp
Eco R-I	10.5
Hind-III	5.1, 3.4, 2.0
BamH-I	7.3, 3.2
Eco R-I + Hind-III	4.0, 3.4, 2.0, 1.1
Eco R-I + BamH-I	6.7, 3.2, 0.6
Hind-III + BamH-I	4.6, 2.7, 2.0, 0.7,0.5
Eco R-I + Hind-III + BamH-I	4.0, 2.7, 2.0, 0.7, 0.6, 0.5.

Sketch a restriction map of the plasmid using the above data.

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- 7. (a) How does RNA editing contribute to protein diversity in eukaryotes? What roles do guide RNA play in RNA editing? 5
  - (b) What is Attenuation? What role it plays in gene regulation of tryptophan operon in *E. coli* along with repression?
- 8. Write down short notes on any *two* of the following:  $5\times2$ 
  - (a) Cosmid as cloning vector.
  - (b) Enzymes involved in eukaryotic DNA replication.
  - (c) Post transcriptional gene silencing.

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