

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.*



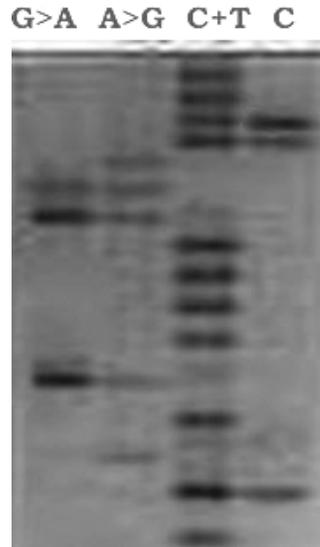
1. Answer the following questions : 2 × 10
- (a) What is *Shine Dalgarno Sequence* ?
Mention the function of this sequence during translation.
- (b) What is the function of Alkaline Phosphatase and Taq DNA polymerase in molecular biology ?

- (c) “Genetic code is degenerate” – Explain with suitable examples.
- (d) An *Hind-III* enzyme has cleaved a genomic DNA of 4.32×10^3 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 6×10^6 and mean efficiency of PCR is 90% ?

- (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 '*T_m*' of DNA. Calculate the '*T_m*' of a 15-mer primer containing 40% GC content.

2. (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 6×10^6 mbp. 3
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

- (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. 4



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

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- (b) Define genome complexity. Narrate the genome composition of human with note on repetitive DNA. 5
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. 4
- (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 :

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

- Sketch a restriction map of the plasmid using the above data. 6

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Contd.

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 ? 5
8. Write down short notes on any *two* of the following : 5×2
- (a) Cosmid as cloning vector.
- (b) Enzymes involved in eukaryotic DNA replication.
- (c) Post transcriptional gene silencing.
