



M.TECH. DEGREE EXAMINATIONS: NOV/DEC 2023

(Regulation 2018)

First Semester

BIOTECHNOLOGY

P18BTI1201: Gene Expression and Analysis

COURSE OUTCOMES

- CO1:** Comprehend the role of various genetic elements influencing gene expression in prokaryotes.
CO2: Applying gene regulation for recombinant protein expression.
CO3: Critique the role of various genetic elements influencing the gene expression eukaryotes.
CO4: Acquire skill set required to characterize recombinant proteins from various host systems.
CO5: Apply the knowledge to understand the genetic diseases and gene expression.
CO6: Quantify the gene expression for molecular diagnosis of diseases.

Time: Three Hours

Maximum Marks: 100

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

- Codon pair deoptimization involves.... CO1 [K₃]
 - Deleting a gene pair
 - Equalizing gene expression
 - Enhancing gene expression
 - Silencing gene expression
- Yeast is the most used heterologous host for eukaryotic recombinant protein expression. Choose the correct reason. CO1 [K₃]
 - Able to do correct post-translational modification
 - Able to form recombinant protein aggregate
 - Able to export the recombinant protein
 - Able to cleave recombinant proteins in the cytoplasm
- A researcher is working on a project involving isolation and purification of a thermostable enzyme from *Bacillus* sp. Calculate the size of the protein expected from a 3500 bp gene?. CO2 [K₃]
 - 108.2 kDa
 - 68 kDA
 - 128.2 kDa
 - 58 kDA
- Match the genetic elements with the function in an expression vector CO2 [K₁]

22. What are the “cis” acting and “trans” acting factors that influence the gene expression in eukaryotes? CO2 [K₂]
23. Explain the role of MicroRNA in the regulation of gene expression in eukaryotes and add a note on the miRNA biogenesis pathway. CO2 [K₂]
24. Draw the vector map of an expression vector and explain the role of any FOUR genetic elements that support the production and purification of recombinant proteins. CO4 [K₃]
25. Elaborate on genome imprinting and why is it called epigenetic process? CO5 [K₃]
26. What is aberrant RNA splicing and how do you investigate aberrant splicing? CO6 [K₂]

Answer any FOUR Questions
PART D (4 x 10 = 40 Marks)

27. Evaluate the challenges involved in expressing a eukaryotic gene in a prokaryotic heterologous host. Provide any four potential solutions to troubleshoot the issues for the successful expression of the recombinant protein. CO1 [K₂]
28. How do hormones control gene expression in eukaryotes? And explain this with a suitable case study. CO3 [K₃]
29. i. What is cell-free protein synthesis and compare it with in vivo production of a recombinant protein? CO4 [K₂]
5
ii. How does a fusion tag help to single-step purify a recombinant protein from other cellular protein of a heterologous host? Explain the steps with a suitable example.
30. In the process of developing a molecular diagnosis method for a human genetic disease, a research team is planning to use cDNA microarray. Design an experimental set-up to achieve their project objective. CO5 [K₄]
31. Elaborate on the symptoms, diagnosis, inheritance pattern, and treatment method for sickle cell anemia. CO6 [K₂]
