



SCHOOL OF BIOSCIENCES AND TECHNOLOGY
CONTINUOUS ASSESSMENT TEST - II
WINTER SEMESTER 2025-2026

Programme Name & Branch : B.Tech Biotechnology
Course Code and Course Name : BBIT209L Molecular Biology
Slot(s) : B1+TB1
Faculty Name(s) : K M Gothandam
Class Number(s) : 2451
Date of Examination : 16/03/2026
Exam Duration : 90 minutes Maximum Marks: 50

General instruction(s):

- Answer All Questions
- CO – Course Outcome; BL – Blooms Taxonomy Level (1 – Remember, 2 – Understand, 3 – Apply, 4 – Analyse, 5 – Evaluate, 6 – Create)

Q. No	Question	M	CO	BL
1.	Identify the statements are true or false i. In eukaryotes, assembly of the pre-initiation complex can occur in the absence of RNA polymerase II. ii. ATP hydrolysis is directly required for phosphodiester bond formation during RNA chain elongation. iii. Enhancers can function upstream, downstream, or within genes in eukaryotes but not in prokaryotes. iv. All three eukaryotic RNA polymerases recognize the same promoter sequences. v. Polyadenylation occurs before transcription termination in eukaryotes. vi. Lack of 5' capping in eukaryotic mRNA would prevent transcription but not translation. vii. In bacteria, transcription and translation can occur simultaneously, but this is prevented in eukaryotes due to compartmentalization. viii. The presence of histones directly affects transcription regulation in prokaryotes. ix. Spliceosome-mediated splicing requires recognition of conserved sequences at the 5' splice site, 3' splice site, and branch point. x. All eukaryotic genes undergo alternative splicing.	10	3	3

2.	A segment of bacterial DNA is shown below. The promoter (-35 and -10 regions) and +1 site are indicated. The top strand runs 3' → 5' from left to right. The bottom strand runs 5' → 3'. <pre> +1 -10 -35 ... 3' TTGCATCCGAAACGTACGATCGATGGCCGACTTATTATGATCGGACTACTGCGTCGTAGC5' 5' AACGTAGGCTTTGCATGCTAGCTAGCCGGCTGAATAATCTAGCCTGATCAGCAGCATCG3' ... </pre> a. Which strand serves as the template for transcription? Explain. b. Write the first 8 nucleotides of the RNA transcript. Indicate 5' and 3' ends. c. If the -10 sequence is mutated from TATAAT to TATCGT, what happens to transcription efficiency? d. If the +1 base changes from G to A, how will the RNA change? e. Would this mutation affect translation directly? Why or why not?	10	3	4
3.	Below is a bacterial mRNA. Answer the question based on the figure. 5' AGGAGGUUACCAUGGCCUUUACGAAUGGCUAAACCGUGA 3' a. Identify the Shine-Dalgarno sequence. b. Identify the start codon. c. How many amino acids long is the protein? d. What is the third amino acid in the sequence? e. If the UAA codon mutates to UCA, what happens?	10	4	3
4.	Discuss the reasons why translation is an energy-intensive cellular process and list out all the energy-dependent steps involved in eukaryotic translation.	10	4	3
5.	Scientists are investigating gene regulation in the trp operon in <i>Escherichia coli</i>. They grow bacteria in two different media: • Medium 1: No tryptophan present • Medium 2: High concentration of tryptophan Based on the above fact answer the following questions a) Predict the transcription level of the trp operon in both media. Explain your reasoning. b) Describe how tryptophan acts as a corepressor in this system. c) Explain why the trp operon is classified as a repressible operon. d) Discuss how this regulatory mechanism helps conserve cellular energy.	10	5	4
