Name: **Enrolment No:**	UPES UNIVERSITY OF TOMORROW

UPES

End Semester Examination, December 2023

Course: Molecular Biology **Semester:** IIIrd
Program: B.Tech (Biomedical Eng) **Time :** 03 hrs
Course Code: HSMB2026 **Max. Marks:** 100

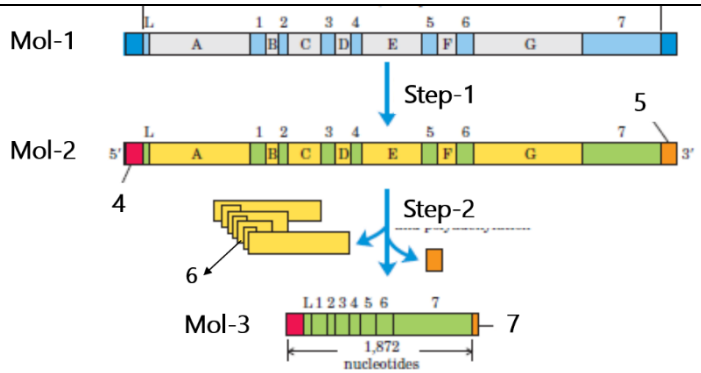
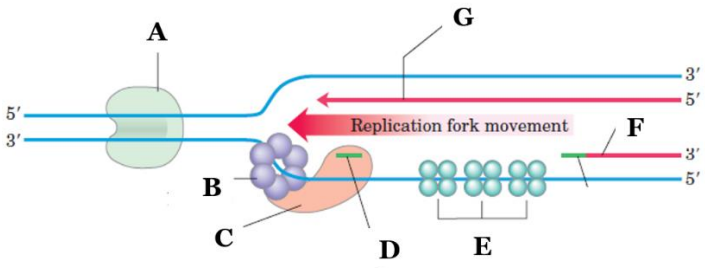
Instructions:

Q.No	**Section A** **MCQs/Short answer questions/True &False**	**(20x1.5=30 Marks)**	**COs**
Q	Statement of question (each question carries 1.5 marks)		CO
1.	Name the RNA molecule which takes part in the formation of the ribosome? a) mRNA b) tRNA c) rRNA d) gRNA	1.5	CO1
2.	Which of the following combination is a correct observation for the transformation experiment performed by Griffith? a) Type S (living) + mouse = dead b) Type S (heat killed) + mouse = dead c) Type R (living) + mouse = dead d) Type S (heat killed) + type R (living) + mouse = living	1.5	CO1
3.	What were the main criteria taken under consideration for the experiment Name the secondary structure of tRNA? a) Cloverleaf b) L-shaped c) Duplex d) Triple Helix	1.5	CO1
4.	Check which one of the following mechanisms is wrongly paired with its location of occurrence? a) Transcription – nucleus b) Post transcriptional mechanism – ER c) Translation – cytoplasm d) Post translational mechanism – ER	1.5	CO1
5.	Name the subunit that ensures high processivity of DNA Pol III? a) α	1.5	CO2

	b) τ' c) γ d) β		
6.	Double helix formed by RNA is more stable than DNA. a) True b) False	1.5	CO2
7.	Which of the following is used in prokaryotic replication? a) DNA polymerase I b) DNA polymerase II c) DNA polymerase III d) DNA polymerase δ	1.5	CO1
8.	The RNA polymerase core enzyme converts into a holoenzyme on the addition of the _____ subunit. a) α b) β c) β' d) σ	1.5	CO1
9.	In some viruses, RNA serves as the storage of genetic materials and DNA is synthesized from RNA by the enzyme known as: a) DNA synthetase b) DNA polymerase c) Reverse transcriptase d) DNA convertase	1.5	CO2
10.	The codon is a _____ a) Singlet b) Duplet c) Triplet d) Quadruplet	1.5	CO2
11.	The second and further aminoacyl-tRNAs are brought to the ribosome bound to which of the following protein complex? a) EF-Ts-ATP b) EF-Ts-GTP c) EF-Tu-ATP d) EF-Tu-GTP	1.5	CO2
12.	For the charging of tRNA molecules, the acyl linkage occurs between the carboxyl group of the amino acid to the _____ a) 2' hydroxyl group of A b) 3' hydroxyl group of T c) 2' hydroxyl group of G	1.5	CO2

	d) 3' hydroxyl group of C		
13.	Which of the following initiation factor when bound to the 30S subunit blocks the A site, so that only the P site is available for the initiator tRNA to bind to? a) IF-4 b) IF-2 c) IF-3 d) IF-1	1.5	CO2
14.	The first RNA processing event is _____ a) Capping b) Tailing c) Splicing d) Editing	1.5	CO3
15.	The initiation codon is a) AUG b) UAA c) UAG d) UGA	1.5	CO3
16.	Which of the following is the most energetically costly process among the following? a) Replication b) Transcription c) Post transcriptional processing d) Translation	1.5	CO3
17.	Shine – Dalgarno sequence is also known as the _____ a) ORF b) RBS c) Stop codon d) Start codon	1.5	CO4
18.	Which of the following process does not occur in prokaryotes? a) Replication b) Splicing c) Translation d) Transcription	1.5	CO4
19.	Which of the following enzyme has a unique ability to introduce positive and negative supercoiling of the DNA and it is the target for antibacterial agents such as ciprofloxacin/quinolones? a) Dna A protein b) DNA helicase c) DNA gyrase	1.5	CO3

	d) DNA polymerase		
20.	DNA helices exist in various forms. Which of the following form is predominantly expressed in cells? a) B- Helix b) A-Helix c) E-Helix d) Z-Helix	1.5	CO2
	Section B	**(4x5=20 Marks)**	CO
Q	Statement of question (each question carries 5 marks)		
1.	(a) Give a well labelled diagram of a DNA backbone. (b) Compare between different forms of DNA (B, A and Z) on the basis of their sense, diameter and number of helices per turn.	2+3	CO1
2.	(a) Draw a well labelled diagram showing the arrangement of consensus sequences in the E. coli replication origin, OriC. (b) Briefly describe the role of : i. DNAa, ii. DNAb and iii. Dam methylase in the process of initiation of replication	2+3	CO2
3.	(a) Briefly describe how RNA Polymerase and Transcription Factors assemble at a Promoter site. Draw a well labelled diagram for the same. (b) Discuss the role of TFIIA, TFIIB, TFIIE and TFIIF in Transcription.	3+2	CO4
4.	(a) What is Genetic Code? (b) Briefly describe three characteristic traits of Genetic Code. Explain what is the basis of degeneracy of codons?	2+3	CO3
	Section C	**(2x15=30 Marks)**	
Q	Statement of question (Case studies: each question carries 15 marks)		CO
1.	In reference to the following figure answer the following questions:	15 (3+2+2+4+2+2)	CO4

	 a) Identify the Biomolecules 1, 2 and 3 (Mol-1, Mol-2, Mol-3)? b) State how Mol-2 differs from Mol-3? c) Discuss which of the two molecules (Mol-1 and Mol-3) are more stable and why? d) Label 4-7 e) Predict what would happen to a Mol-3, if it lacks 4 and 7? f) Briefly summarize Step-1 and Step-2?		
2.	In reference to the following figure answer the following questions:  a) Label A-G. b) Discuss the function of A, B, C, and E? c) State how the replication of G differs from that of F d) Who discovered the mode of replication in F? e) Name the enzyme which mediates the process shown in the figure above. f) State the function of Ligase and DNA Pol-1 in the process shown in the figure above. g) What is the nature of D?	15 (4+4+2+1+1+2+1)	CO4
	Section D	**(2x10=20 Marks)**	
Q	Statement of question (each question carries 10 marks)		CO
1.	a) Elaborate how self-splicing introns are processed in primary transcript? Draw a well labelled diagram showing the events of splicing. b) What is a ribozyme? Give an example c) Compare between RNA-based and Protein-based termination of transcription?	5+2+3	CO4

d)	a) Discuss the following events in the process of translation: i) Activation of amino acyl t-RNA, ii) Initiation, iii) Elongation and iv) Termination in prokaryotic translation? (Draw a well labelled diagram for each step) b) What are post-translational modifications? Explain with the help of a relevant example?	8+2	CO2