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

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, May 2022

Course: Molecular Biology and Recombinant DNA Technology **Semester: IInd**
Program: B. Tech (Biotechnology) **Time : 03 hrs.**
Course Code: HSBT 1002 **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.	Which of the σ factors is heat stable? a) δ70 b) δ32 c) δ28 d) δ54	1.5	CO3
2.	Name the type of RNA molecule which copies the genetic information from DNA? a) mRNA b) tRNA c) rRNA d) sRNA	1.5	CO3
3.	Hershey and Chase experiment for the validation of DNA as a genetic material was based on which principle? a) Transformation b) Transduction c) Conjugation d) None of the above	1.5	
4.	Mode of DNA replication is: a) Conservative and bidirectional b) Semiconservative and unidirectional c) Semiconservative and bidirectional d) Conservative and unidirectional	1.5	
5.	The mRNA codon for methionine is a) AUG b) UGG c) CCA	1.5	

	d) TTG		
6.	Which of the following processes does not occur in prokaryotes? a. Transcription b. Splicing c. Translation d. Replication	1.5	
7.	State True or False: Primer is needed for DNA replication?	1.5	
8.	What is the function of Carboxyl Terminal Domain in RNA polymerase? a) Undergoes phosphorylation and activates RNA Pol b) Helps in initiation of the transcription c) Facilitates interaction between different enzymes and transcription complex d) All of the above	1.5	
9.	What is the significance of TATA box in eukaryotic transcription?	1.5	
10.	Compare between introns and exons?	1.5	
11.	"SNURPs" are made up of: a) RNA b) Protein c) DNA and protein d) RNA and protein	1.5	
12.	Which of the following is the unusual nucleotide that is added to the 5'-end of the hnRNA during capping? a) Methyl Guanosine Triphosphate b) Adenine c) Guanine d) Adenosine Triphosphate	1.5	
13.	Compare between siRNA and piRNA?	1.5	
14.	State True or False: Amino acid binds with 3' end of t-RNA	1.5	
15.	The tRNA (f-met-tRNA) binds to: a) Formyl methionine b) Formic acid c) Methionine	1.5	

	d) Glutamine		
16.	Compare between codon and anticodon.	1.5	
17.	What is the significance of shine dalgarno sequence?	1.5	
18.	An expression vector differs from cloning vector in having: a) An origin of replication b) Selectable marker genes c) Unique restriction sites d) Control elements/ cassettes	1.5	
19.	Which of these silence transposons? a) miRNA b) siRNA c) piRNA d) mRNA	1.5	
20.	Name three essential ingredients for a PCR reaction master-mix?	1.5	
	Section B	**(4x5=20 Marks)**	CO
Q	Statement of question (each question carries 5 marks)		
1.	(a) Draw a well labelled diagram of DNA backbone. (b) Mention three salient ways in which a DNA molecule differs from a RNA molecule?	2+3	CO1
2.	(a) Describe the process of "Rho-independent" transcriptional termination. Draw a well labelled diagram for the same. (b) What are the two classical differences between "Rho-independent" and " Rho-dependent" modes of transcriptional termination	3+2	CO2
3.	(a) Explain the formation of "spliceosomal complex" and the mechanism of splicing in Group III intron. (b) Draw a well labelled diagram for the same.	3+2	CO3
4.	(a) What are competent cells and why are they needed in the process of cloning? (b) Compare different protocols for obtaining the competent bacterial cells?	3+2	CO4
	Section C	**(2x15=30 Marks)**	
Q	Statement of question (Case studies) (each question carries 15 marks)		CO

1.	In the process of protein synthesis, a newly synthesized 63kDa polypeptide reduces to 51kDa as a result of Post-Translational Modification (PTM). Explain: a) What are Post-translational modifications? Why do newly synthesized polypeptides undergo PTM? b) Predict and briefly explain two possible modifications that the above stated 63kDa protein might have undergone? c) Give two examples of PTMs where prosthetic groups are introduced in the polypeptide vital for their biological activity? d) Explain the formation of Disulphide cross-links with an example.	15 (5+4+3+3)	CO3
2.	A gene of interest (G1) was cloned in a cloning vector pBR322 after digestion of the plasmid backbone by a restriction endonuclease. After the process of transformation bacterial cells were plated on a media. a) Give a diagram (or restriction map) of a typical DNA cloning vector- plasmid pBR322. b) Mention two classical differences between a cloning vector and an expression vector. c) Describe how would you differentiate between "Non-Transformants" and "Transformants" employing blue-white screening assay? What is the reporter gene that facilitates this distinction? d) Discuss what would happen: (i) If you forgot to add ampicillin in the media prior to plating the transformed cells? (ii) If you forgot to add the Substrate (X-Gal) in the media prior to plating the transformed cells? (iii) If all the colonies obtained were blue. What would you interpret from this observation? (iv) How would you confirm the insert sequence from the white colonies?	15 (3+2+2+2+2+2+2)	CO4
	Section D	**(2x10=20 Marks)**	
Q	Statement of question (each question carries 10 marks)		CO
1.	a) Explain the events of: i) Activation of amino acyl t-RNA,	8+2	CO3

	ii) Initiation, iii) Elongation and iv) Termination in prokaryotic translation? (Draw a well labelled diagram for each step) b) Give two differences between prokaryotic and eukaryotic translation?		
2.	What is CRISPR? a) Discuss it as an RNA guided defense mechanism against viruses prevalent in prokaryotes. b) Discuss how CRISPR/ Cas is being currently harnessed as a genome editing tool.	5+5	CO2