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

UPES

End Semester Examination, December 2024

Course: Molecular Biology and Genetics **Semester:3rd**

Program: BT-BIOMEDICAL & BT-BIOTECHNOLOGY **Duration: 3 Hours**

Course Code: HSBE2005 **Max. Marks: 100**

Instructions: Attempt all questions

S. No.	Section A Short answer questions/ MCQ/T&F (20Qx1.5M= 30 Marks)	Marks	COs
Q 1	If the DNA strand has nitrogenous base sequence 3'ATTGCC5', will the mRNA have? A. 5'ATTGCA3' B. 3'UAACGG5' C. 5'UAACGG3' D. 3'ATCGCC5'	**1.5**	**CO3**
Q 2	DNA replication is A. conservative B. conservative and semi-discontinuous C. semi-conservative and discontinuous D. semi-conservative and semi-discontinuous	**1.5**	**CO1**
Q 3	The core histone proteins are----------	**1.5**	**CO2**
Q 4	The number of replicons is found in E. coli? A. Five replicon B. Two replicon C. Single replicon D. Multiple replicon	**1.5**	**CO2**
Q 5	The segregation of allelic pair occurs during meiosis stage…….	**1.5**	**CO3**
Q 6	An enzyme performs decatenation? A. Polymerase B. Topoisomerase C. Telomerase D. Decatenase	**1.5**	**CO2**
Q 7	Who discovered the structure of DNA? A. Meischer B. Avery	**1.5**	**CO1**

	C. Watson and Crick D. Franklin		
Q 8	RNA cannot store genetic information. (True or False)	**1.5**	**CO1**
Q 9	DNA supercoiling is primarily managed by which enzyme? A. DNA polymerase B. DNA helicase C. DNA topoisomerase D. DNA ligase	**1.5**	**CO2**
Q 10	The Meselson-Stahl experiment proved DNA replication is: A. Discontinuous B. Conservative C. Semi-conservative D. Random	**1.5**	**CO4**
Q 11	Okazaki fragments are synthesized on the leading strand during replication. (True or False)	**1.5**	**CO2**
Q 12	Which enzyme catalyzes the synthesis of RNA from a DNA template? A. DNA polymerase B. RNA polymerase C. Helicase D. Primase	**1.5**	**CO2**
Q 13	Alternative splicing can produce multiple proteins from a single gene. (True or False)	**1.5**	**CO2**
Q 14	In rho-independent termination, the RNA transcript forms a: A. Stem-loop structure B. Promoter complex C. Poly-A tail D. Sigma factor	**1.5**	**CO1**
Q 15	What is the first amino acid incorporated during translation in prokaryotes? A. Methionine B. Formyl-methionine C. Serine D. Glycine	**1.5**	**CO2**
Q 16	Aminoacyl-tRNA synthetase charges tRNA with the correct amino acid. (True or False)	**1.5**	**CO1**
Q 17	A cross between a tall pea plant (TT) and a dwarf pea plant (tt) results in: A. All tall offspring B. All dwarf offspring C. A 3:1 tall to dwarf ratio D. A 1:1 tall to dwarf ratio	**1.5**	**CO4**
Q 18	Aneuploidy is a chromosomal mutation involving changes in the arrangement of genes. (True or False)	**1.5**	**CO1**

Q 19	DNA methylation typically occurs at which nucleotide sequence? A. GC B. AT C. CpG D. TA	**1.5**	**CO1**
Q 20	Name one epigenetic mechanism that can silence gene expression. (True or False)	**1.5**	**CO2**
	Section B **(4Qx5M=20 Marks)**		
Q 1	What are nucleosomes, and how do they contribute to the higher-order structure of chromosomes?	**5**	**CO3**
Q 2	Differentiate between the leading and lagging strands during DNA replication.	**5**	**CO3**
Q 3	How does histone acetylation affect gene expression?	**5**	**CO2**
Q 4	Compare the transcription process in prokaryotes and eukaryotes, highlighting three major differences.	**5**	**CO2**
	Section C **(2Qx15M=30 Marks)**		
Q 1	Discuss the mechanisms of epigenetic regulation, focusing on DNA methylation, histone modifications, and non-coding RNAs. ***(10 Marks)*** Explain their role in gene expression and their implications in health and disease. ***(5 Marks)***	**15**	**CO4**
Q2	Describe the complete mechanism of DNA replication in prokaryotes. Include a detailed discussion of the enzymes involved and the steps of initiation, elongation, and termination.	**15**	**CO1**
	Section D **(2Qx10M=20 Marks)**		
Q 1	Explain the process of transcription in prokaryotes, including the roles of RNA polymerase and promoter sequences. Discuss the differences between rho-dependent and rho-independent termination.	**10**	**CO3**
Q2	Explain the process of genomic imprinting and its molecular basis. Discuss how defects in imprinting lead to human disorders such as Prader-Willi Syndrome (PWS) and Angelman Syndrome (AS).	**10**	**CO2**