


Name:			
Enrolment No:			
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. <i>(10 Marks)</i> Explain their role in gene expression and their implications in health and disease. <i>(5 Marks)</i>	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