


Name:			
Enrolment No:			
UPES End Semester Examination, December 2024			
Course: Molecular Biology and Genetics Program: BT-BIOMEDICAL & BT-BIOTECHNOLOGY		Semester: 3rd Duration: 3 Hours	
Course Code: HSBE2005 Instructions: Attempt all questions		Max. Marks: 100	
S. No.	Section A Short answer questions/ MCQ/T&F (20Qx1.5M= 30 Marks)	Marks	COs
Q 1	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 2	What is the structural unit of chromatin?	1.5	CO1
Q 3	Supercoiling of DNA helps in compacting the chromosome. (True or False)	1.5	CO1
Q 4	Which enzyme removes RNA primers during DNA replication? A. DNA helicase B. DNA polymerase I C. DNA polymerase III D. DNA ligase	1.5	CO2
Q 5	The sigma factor of RNA polymerase in prokaryotes is responsible for: A. Elongation B. Promoter recognition C. Termination D. Proofreading	1.5	CO2
Q 6	Name one post-translational modification.	1.5	CO1
Q 7	What triggers the termination of translation? A. Stop codon B. Poly-A tail C. Start codon D. Promoter sequence	1.5	CO2
Q 8	What is codominance?	1.5	CO3
Q 9	Methylation of DNA typically leads to gene activation. (True or False)	1.5	CO3
Q 10	Alternative splicing can produce multiple proteins from a single gene. (True or False)	1.5	CO2

Q 11	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 12	What is the first amino acid incorporated during translation in prokaryotes? A. Methionine B. Formyl-methionine C. Serine D. Glycine	1.5	CO2
Q 13	Aminoacyl-tRNA synthetase charges tRNA with the correct amino acid. (True or False)	1.5	CO1
Q 14	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 15	DNA methylation typically occurs at which nucleotide sequence? A. GC B. AT C. CpG D. TA	1.5	CO1
Q 16	Name one epigenetic mechanism that can silence gene expression. (True or False)	1.5	CO2
Q 17	If the DNA strand has nitrogenous base sequence 3'ATTGCC5', will the mRNA have? A. 5'ATTGCA3' B. 3'UAACGG5' C. 5'UAACGG3' 3'ATCGCC5'	1.5	CO3
Q 18	DNA replication is A. conservative B. conservative and semi-discontinuous C. semi-conservative and discontinuous semi-conservative and semi-discontinuous	1.5	CO1
Q 19	An enzyme performs decatenation? A. Polymerase B. Topoisomerase C. Telomerase Decatenase	1.5	CO2
Q 20	Who discovered the structure of DNA? A. Meischer B. Avery	1.5	CO1

	C. Watson and Crick D. Franklin		
Section B (4Qx5M=20 Marks)			
Q 1	Differentiate between the leading and lagging strands during DNA replication.	5	CO3
Q 2	How does histone acetylation affect gene expression?	5	CO2
Q 3	Describe the process of DNA replication in prokaryotes, emphasizing the role of key enzymes.	5	CO2
Q 4	What is dosage compensation. Give one example.	5	CO3
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	CO2
Q2	Describe the process of protein synthesis (translation) in eukaryotes, including the roles of ribosomes, tRNA, and associated factors.	15	CO2
Section D (2Qx10M=20 Marks)			
Q 1	Compare and contrast the mechanisms of DNA replication in prokaryotes and eukaryotes. (5 Marks) Highlight the key similarities and differences. (5 Marks)	10	CO3
Q2	Discuss the molecular mechanisms of DNA methylation and its role in gene expression regulation. (5 Marks) How does DNA methylation contribute to human diseases such as cancer? (5 Marks)	10	CO3