


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

<b>Q 11</b>	In rho-independent termination, the RNA transcript forms a: A. Stem-loop structure B. Promoter complex C. Poly-A tail D. Sigma factor	<b>1.5</b>	<b>CO1</b>
<b>Q 12</b>	What is the first amino acid incorporated during translation in prokaryotes? A. Methionine B. Formyl-methionine C. Serine D. Glycine	<b>1.5</b>	<b>CO2</b>
<b>Q 13</b>	Aminoacyl-tRNA synthetase charges tRNA with the correct amino acid. (True or False)	<b>1.5</b>	<b>CO1</b>
<b>Q 14</b>	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	<b>1.5</b>	<b>CO4</b>
<b>Q 15</b>	DNA methylation typically occurs at which nucleotide sequence? A. GC B. AT C. CpG D. TA	<b>1.5</b>	<b>CO1</b>
<b>Q 16</b>	Name one epigenetic mechanism that can silence gene expression. (True or False)	<b>1.5</b>	<b>CO2</b>
<b>Q 17</b>	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'	<b>1.5</b>	<b>CO3</b>
<b>Q 18</b>	DNA replication is A. conservative B. conservative and semi-discontinuous C. semi-conservative and discontinuous semi-conservative and semi-discontinuous	<b>1.5</b>	<b>CO1</b>
<b>Q 19</b>	An enzyme performs decatenation? A. Polymerase B. Topoisomerase C. Telomerase Decatenase	<b>1.5</b>	<b>CO2</b>
<b>Q 20</b>	Who discovered the structure of DNA? A. Meischer B. Avery	<b>1.5</b>	<b>CO1</b>

	C. Watson and Crick D. Franklin		
<b>Section B</b> <b>(4Qx5M=20 Marks)</b>			
<b>Q 1</b>	Differentiate between the leading and lagging strands during DNA replication.	<b>5</b>	<b>CO3</b>
<b>Q 2</b>	How does histone acetylation affect gene expression?	<b>5</b>	<b>CO2</b>
<b>Q 3</b>	Describe the process of DNA replication in prokaryotes, emphasizing the role of key enzymes.	<b>5</b>	<b>CO2</b>
<b>Q 4</b>	What is dosage compensation. Give one example.	<b>5</b>	<b>CO3</b>
<b>Section C</b> <b>(2Qx15M=30 Marks)</b>			
<b>Q 1</b>	Discuss the mechanisms of epigenetic regulation, focusing on DNA methylation, histone modifications, and non-coding RNAs. <b>(10 Marks)</b> Explain their role in gene expression and their implications in health and disease. <b>(5 Marks)</b>	<b>15</b>	<b>CO2</b>
<b>Q2</b>	Describe the process of protein synthesis (translation) in eukaryotes, including the roles of ribosomes, tRNA, and associated factors.	<b>15</b>	<b>CO2</b>
<b>Section D</b> <b>(2Qx10M=20 Marks)</b>			
<b>Q 1</b>	Compare and contrast the mechanisms of DNA replication in prokaryotes and eukaryotes. <b>(5 Marks)</b> Highlight the key similarities and differences. <b>(5 Marks)</b>	<b>10</b>	<b>CO3</b>
<b>Q2</b>	Discuss the molecular mechanisms of DNA methylation and its role in gene expression regulation. <b>(5 Marks)</b> How does DNA methylation contribute to human diseases such as cancer? <b>(5 Marks)</b>	<b>10</b>	<b>CO3</b>