

Name:

Enrolment No:



UPES

End Semester Examination, May 2024

Course: Molecular Biology and Genetics

Program: MSc. Microbiology

Course Code: HSMB7026

Semester : II

Duration : 3 Hours

Max. Marks: 100

Instructions:

S. No.	Section A Short answer questions/ MCQ/T&F (20Qx1.5M= 30 Marks)	Marks	COs
Q 1	Discuss what is central dogma of molecular biology in 1-2 lines?	1.5	CO1
Q 2	Enlist the substrates of a Helicase enzyme.	1.5	CO2
Q 3	Prokaryotes contain a _____ chromosome, and eukaryotes contain _____ chromosomes. 1. single-stranded circular; single-stranded linear 2. single-stranded linear; single-stranded circular 3. double-stranded circular; double-stranded linear 4. double-stranded linear; double-stranded circular	1.5	CO2
Q 4	A promoter is _____ 1. a specific sequence of DNA nucleotides 2. a specific sequence of RNA nucleotides 3. a protein that binds to DNA 4. an enzyme that synthesizes RNA	1.5	CO1
Q 5	The RNA components of ribosomes are synthesized in the _____ 1. cytoplasm 2. nucleus 3. nucleolus 4. endoplasmic reticulum	1.5	CO1
Q 6	Decipher the length of the peptide that can be translated from this mRNA sequence: 5'-AUGGGCUACCGA-3'? 1. 0 2. 2 3. 3 4. 4	1.5	CO2
Q 7	Control of gene expression in eukaryotic cells occurs at which level(s)? 1. only the transcriptional level 2. epigenetic and transcriptional levels	1.5	CO3

	<ol style="list-style-type: none"> 3. epigenetic, transcriptional, and translational levels 4. epigenetic, transcriptional, post-transcriptional, translational, and post-translational levels 		
Q 8	<p>Post-translational control refers to:</p> <ol style="list-style-type: none"> 1. regulation of gene expression after transcription 2. regulation of gene expression after translation 3. control of epigenetic activation 4. period between transcription and translation 	1.5	CO1
Q 9	<p>Portions of eukaryotic mRNA sequence that are removed during RNA processing are _____</p> <ol style="list-style-type: none"> 1. exons 2. caps 3. poly-A tails 4. introns 	1.5	CO1
Q 10	<p>The beta chain of eukaryotic hemoglobin is composed of 141 amino acids. Deduce the minimum number of nucleotides for an mRNA coding this polypeptide chain from this information?</p>	1.5	CO2
Q11	<p>Given are two sequences below; from amongst them identify the one with an open reading frame</p> <ol style="list-style-type: none"> a. 5'-AUGAGUCUGUGGUGA-3' b. 5-UGAGUCUGUGGUGA-3' 	1.5	CO3
Q12	<p>From the same two sequences below, attempt to infer if a mutation has happened and if so what kind of mutation is it?</p> <ol style="list-style-type: none"> a. 5'-AUGAGUCUGUGGUGA-3' b. 5'-UGAGUCUGUGGUGA-3' 	1.5	CO3
Q13	<p>Differentiate between initiation of translation in prokaryotes versus eukaryotes with 2 major differences.</p>	1.5	CO3
Q14	<p>Name a translation inhibitor.</p>	1.5	CO1
Q15	<p>Ribosomes are conserved yet different in prokaryotes versus eukaryotes. Comment on the statement.</p>	1.5	CO2
Q16	<p>Define wobble hypothesis.</p>	1.5	CO1
Q17	<p>Name a ribozyme.</p>	1.5	CO1
Q18	<p>Which has more secondary structure DNA or RNA?</p>	1.5	CO2
Q19	<p>'Protein starts to fold on the ribosome.' Comment on the statement.</p>	1.5	CO3
Q20	<p>Genetic code is:</p> <ol style="list-style-type: none"> 1. Same in prokaryotes 2. Universal with exceptions 3. Universal 4. Both degenerate and universal 	1.5	CO2
Section B			
(4Qx5M=20 Marks)			
Q 1	<p>Differentiate between eukaryotic ribosome and a prokaryotic one.</p>	5	CO2
Q 2	<p>With the help of illustration, flow chart and text; differentiate between group I and group II introns. Also, highlight one similarity.</p>	5	CO1

Q 3	Demonstrate how Griffith's discovered transformation.	5	CO1
Q 4	How was the structure of DNA deciphered? Write salient features about structure of DNA.	5	CO2
Section C (2Qx15M=30 Marks)			
Q 1	Bacterial ribosomes are extracted from cells and treated with protease, the peptide bond formation activity is retained. Given this answer the following: 1) What is activity of ribosome called and why is it retained upon treatment with protease? 2) Explain structural difference between prokaryotic and eukaryotic ribosomes. 3) Explain the process of prokaryotic translation with suitable illustrations. 4) Will the ribosome retain its activity if treated with RNase? If yes, why; if no why. 5) Name one antibiotic which inhibits bacterial translation.	15 (2+3+7+2+1)	CO3
Q 2	Xeroderma pigmentosum is a rare autosomal recessive diseased condition which is characterized by severe photosensitivity in particular sunrays, skin pigmentary changes, malignant tumor development, and occasionally progressive neurologic degeneration. Given this answer the following: 1. What is this condition due to? 2. Referring to it being rare what is the mechanism/pathway in our body that operates to counteract this condition? 3. What damage does sun rays do to our skin? 4. Are there any other mechanisms other than that involved in Xeroderma pigmentosum correcting the UV induced damage? 5. What are base analogues? How do they cause mutations? Explain with at least one example.	15 (1+5+1+3+5)	CO3
Section D (2Qx10M=20 Marks)			
Q 1	(i) How many types of RNA polymerase does a prokaryote have? And how many RNA polymerases are present in eukaryotes? (ii) Demonstrate via text and diagram eukaryotic promoter organization.	10 (3+7)	CO2
Q 2	Define transcription. Explain prokaryotic transcription process? What is an extended 10 sequence?	10 (8+2)	CO1