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Q.5	i.	Explain the process of tRNA charging. How do aminoacyl tRNA synthetase ensure the correct amino acid is attached to the corresponding tRNA?	4	3	2	4	2
	ii.	Compare the translation process in prokaryotes and eukaryotes, highlighting differences in ribosome structure and initiation mechanism.	6	3	2	4	2
OR	iii.	Describe the mechanism of translation initiation, elongation, and termination. How do initiation factors and release factors contribute to these processes?	6	2	2	4	2
Q.6		Attempt any two:					
	i.	What is the role of the lac operon in regulating lactose metabolism in E. coli? How does the presence of lactose and glucose affect its function?	5	2	2	5	2
	ii.	How does DNA methylation affect gene expression in eukaryotic cells? Discuss the role of CpG islands in this context.	5	3	2	5	2
	iii.	What are chromosome puffs? How do they indicate active gene transcription during development?	5	2	2	5	2

Total No. of Questions: 6

Total No. of Printed Pages:4

Enrollment No.....



Faculty of Science
End Sem Examination Dec 2024
BT3CO08 Molecular Biology

Programme: B.Sc. Branch/Specialisation: Biotechnology

Duration: 3 Hrs.

Maximum Marks: 60

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d. Assume suitable data if necessary. Notations and symbols have their usual meaning.

		Marks	BL	PO	CO	PSO
Q.1	i.	The lagging strand in prokaryotic DNA replication is synthesised -	1	1	1	1
	(a)	Continuously in the 3'-5' direction				
	(b)	Discontinuously in the 3'-5' direction				
	(c)	Continuously in the 5'-3' direction				
	(d)	Discontinuously in the 3'-5' direction				
	ii.	The Replication Fork is formed at the-	1	2	1	1
	(a)	Promoter region				
	(b)	Termination site				
	(c)	Coding sequence				
	(d)	Origin of replication				
	iii.	Which DNA repair mechanism is specifically involved in repairing Thymine dimers caused by UV radiation?	1	3	3	2
	(a)	Nucleotide Excision Repair				
	(b)	Mismatch Repair				
	(c)	Base Excision Repair				
	(d)	Photoreactivation				
	iv.	The repair mechanism known as Nucleotide Excision Repair is particularly important for repairing DNA damage caused by-	1	2	3	2
	(a)	UV radiation				
	(b)	X rays				
	(c)	Chemical Mutagens				
	(d)	Ionizing Radiation				

P.T.O.

[2]

- v. Which of the following subunits of the RNA polymerase is completely needed to initiate transcription?
 (a) Alpha
 (b) Omega
 (c) Sigma
 (d) Beta **1** 1 2 2 1
- vi. Transcription occurs along a _____ Template forming an m RNA in _____ direction.
 (a) 5'to 3'; 5'to 3'
 (b) 5'to 3': 3'to 5'
 (c) 3'to 5': 5'to 3'
 (d) 3'to 5': 3'to 5' **1** 3 3 3 2
- vii. In which of the following process nucleic acid is not copied to nucleic acid?
 (a) Transcription
 (b) Translation
 (c) Replication
 (d) All of these **1** 3 3 3 2
- viii. An m-RNA synthesised by using 144 nucleotides is capable of producing polypeptide chain of-
 (a) 48 amino acids
 (b) 47 amino acids
 (c) 282 amino acids
 (d) 432 amino acids **1** 3 3 3 2
- ix. Which histone modification is associated with gene repression?
 (a) Acetylation of histone tails
 (b) Phosphorylation of histone H3
 (c) Methylation of histone H3 lysine 9 (H3K9)
 (d) Ubiquitination of histone H2B **1** 2 2 2 2
- x. In the absence of glucose but presence of lactose, which combination of molecules will be bound to the lac operon?
 (a) CAP with cAMP and the lac repressor
 (b) CAP with cAMP only
 (c) Lac repressor only
 (d) Neither CAP nor the lac repressor **1** 3 2 3 2

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- Q.2 i. What is the primosome? What is its function in DNA replication? **2** 2 2 2 2
- ii. Explain the Meselson and Stahl experiment that demonstrated the semiconservative nature of DNA replication. Why was the use of isotopes like ¹⁵N crucial to this experiment? **3** 3 2 3 2
- iii. How does the replication machinery coordinate leading and lagging strand synthesis at replication forks? **5** 4 2 3 2
- OR iv. Explain the experimental evidence that established DNA as the genetic material. **5** 2 2 2 2
- Q.3 i. Explain the step-by-step mechanism of base excision repair (BER). Which enzymes are crucial at each stage? **2** 2 2 2 2
- ii. Describe the process of nonhomologous end joining (NHEJ). How does NHEJ repair double-strand breaks, and what are its limitations? **8** 4 2 4 2
- OR iii. Describe the steps involved in base excision repair (BER). What types of DNA damage does BER address? **8** 4 2 4 2
- Q.4 i. Explain the differences between mRNA, tRNA, and rRNA in terms of their structure and functions **3** 2 2 2 2
- ii. Explain the process of transcription initiation in prokaryotes. How do promoters regulate this process? **7** 3 2 2 2
- OR iii. What is RNA splicing? Why is it essential in eukaryotic cells? Describe the roles of spliceosomes in the process. **7** 3 2 3 2

Marking Scheme
BT3CO08 Molecular Biology

Q.1	i)	(d) Discontinuously in the 3'-5' direction	1
	ii)	(d) Origin of replication	1
	iii)	(d) Photoreactivation	1
	iv)	(a) UV radiation	1
	v)	c) Sigma	1
	vi)	(c) 3'to 5': 5'to 3'	1
	vii)	(b) Translation	1
	viii)	(a) 48 amino acids	1
	ix)	c) Methylation of histone H3 lysine 9 (H3K9)	1
	x)	b) CAP with cAMP only	1
Q.2	i.	Definition- 1 marks Function- 1 marks	2
	ii.	Explanation -2 marks Diagram- 1 marks	3
	iii.	Explanation - 2.5 marks Diagram- 2.5 marks	5
OR	iv.	Explanation -2.5 marks Diagram- 2.5 marks	5
Q.3	i.	Explanation - 2 marks	2
	ii.	Explanation - 2 marks Diagram- 4 marks Limitations- 2 marks	8
OR	iii.	Explanation - 3 marks Diagram- 3 marks Limitations- 2 marks	8

Q.4	i.	Explanation - 2 marks Diagram- 1 marks	3
	ii.	Explanation - 4 marks Diagram- 3 marks	7
OR	iii.	Definition-1 marks Importance- 2 marks Process- 4 marks	7
Q.5	i.	Process- 3 marks Last explanation- 1 marks	4
	ii.	Points- 4 marks Diagram- 2 marks	6
OR	iii.	Mechanism- 4 marks Diagram- 2 marks	6
Q.6		Attempt any two:	
	i.	Diagram- 3 marks Explanation- 2 marks	5
	ii.	Explanation- 2+2 marks Diagram- 1 marks	5
	iii.	Definition- 1 marks Explanation- 3 marks Diagram- 1 marks	5
