

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				

[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

- 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'

- 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

- 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

- 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

- 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 1 2 2 1

[3]

- 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 ^{15}N 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	Q.4	i. Explanation - 2 marks Diagram- 1 marks
	ii)	(d) Origin of replication	1		ii. Explanation - 4 marks Diagram- 3 marks
	iii)	(d)Photoreactivation	1	OR	iii. Definition-1 marks Importance- 2 marks
	iv)	(a) UV radiation	1		Process- 4 marks
	v)	c) Sigma	1	Q.5	i. Process- 3 marks Last explanation- 1 marks
	vi)	(c) 3'to 5': 5'to 3'	1		ii. Points- 4 marks
	vii)	(b)Translation	1	OR	Diagram- 2 marks iii. Mechanism- 4 marks
	viii)	(a) 48 amino acids	1		Diagram- 2 marks
	ix)	c) Methylation of histone H3 lysine 9 (H3K9)	1	Q.6	i. Attempt any two: Diagram- 3 marks
	x)	b) CAP with cAMP only	1		Explanation- 2 marks
Q.2	i.	Definition- 1 marks Function- 1 marks	2	ii.	Explanation- 2+2 marks Diagram- 1 marks
	ii.	Explanation -2 marks Diagram- 1 marks	3	iii.	Definition- 1 marks Explanation- 3 marks
	iii.	Explanation - 2.5 marks Diagram- 2.5 marks	5		Diagram- 1 marks
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	8		
		Limitations- 2 marks			
OR	iii.	Explanation - 3 marks Diagram- 3 marks	8		
		Limitations- 2 marks			