Name:

Enrolment No:



UPES

End Semester Examination, May 2024

Course: Genetically Modified Foods Program: B.Sc Microbiology Course Code: HSFT2010P

Semester : IV Duration : 3 Hours Max. Marks: 100

Instructions: Read all questions carefully

S. No.	Section A	Marks	COs
	Short answer questions/ MCQ/T&F		
	(20Qx1.5M= 30 Marks)		
Q 1	The Cas9 enzyme in CRISPR-Cas9 originates from which	1.5	CO1
	bacteria?		
	A) E. coli B) Streptococcus pyogenes		
	C) Pseudomonas aeruginosa D) Bacillus subtilis		
Q 2	Which of the following is NOT a characteristic of a good gene	1.5	CO1
	transfer vector?		
	A) Self-replication in host organism		
	B) Presence of selectable marker genes		
	C) Large size for easy manipulation		
	D) Multiple restriction enzyme recognition sites		
Q 3	What is the threshold cycle (Ct) in qPCR?	1.5	COI
	A) The cycle at which DNA amplification begins		
	B) The cycle at which fluorescence surpasses background		
	levels		
	C) The cycle at which DNA denaturation occurs		
	D) The cycle at which the PCR reaction ends		
Q 4	Plasmids are commonly used as gene transfer vectors because	1.5	CO1
	they:		
	A) Are linear pieces of DNA		
	B) Replicate independently of the chromosome		
	C) Cannot integrate into the host genome		
	D) Are only found in eukaryotic cells		
Q 5	Which organism is NOT commonly used in genome editing	1.5	CO2
	research?		
	A) Fruit IIy (<i>Drosophila melanogaster</i>) B) Bastaria (<i>Each arishig asli</i>)		
	D) Dacteria (Escherichill coll) C) Voost (Saacharonwaas aarovisiaa)		
	D) Humon (Homo sanians)		
	(D) Human (Homo suprens)		

Q 6	What is the term used to describe unintended changes in the	1.5	CO2
	genome caused by editing techniques?		
	A) Off-target effects		
	B) Silent mutations		
	C) Gene silencing		
	D) Somatic variation		
Q 7	A selectable marker gene in a gene transfer vector allows	1.5	CO2
	scientists to:		
	A) Identify the specific gene of interest		
	C) Increase the convinumber of the foreign DNA		
	D) Modify the expression level of the foreign gene		
0.8	Which of the following is not a genome editing tool?	15	CO^2
Q 0	A) CRISPR-Cas9 B) TAI ENS C) Zinc Finger Nucleases	1.5	002
	($7EN_0$)		
	$(\Sigma \Gamma NS)$ D) DNA interference (DNAi)		
	D) KNA Interference (KNAI)	1.5	002
Q 9	Which of the following is true about Zinc Finger Nucleases	1.5	03
	(ZFNs)?		
	A) They are naturally occurring enzymes in bacteria.		
	B) They are constructed from engineered modular lipo		
	proteins.		
	C) They have a lower precision compared to CRISPR-Cas9.		
	D) They do not require a guide RNA for target specificity.		
Q 10	In the CRISPR-Cas9 system, what is the role of the guide RNA	1.5	CO3
	(gRNA)?		
	A) It serves as the "scissors" to cut DNA.		
	B) It directs Cas9 to the target DNA sequence.		
	C) It provides the template for DNA repair.		
	D) It activates the immune response.		
0.11	Which of the statement hold true for quantitative PCR?	1.5	CO3
	(A) A fluorescent dye is used which binds on single-stranded		
	DNA molecules		
	(B) SYBR green is the only dye used		
	(C) The quantity of DNA is simply measured by measuring the		
	amount of fluorescence		
	(D) This approach is useful if the products are non-specific in		
	(D) This approach is useful if the products are non-specific in		
0.10		1.5	
Q 12	Viruses can be used as gene transfer vectors because they:	1.5	003
	A) Can efficiently infroduce DNA into nost cells B) Paplicate rapidly within the best		
	C) Can integrate their DNA into the host genome		
	D) All of the above		

Q 13	What is the Cas9 protein in the CRISPR system responsible	1.5	CO4
	for?		
	A) Identifying the target DNA sequence		
	B) Delivering the guide RNA to the nucleus		
	C) Replicating the edited DNA		
0.14	D) Repairing the double-strand break		
Q 14	TALENs are:	1.5	CO4
	A) Enzymes derived from bacterial immune systems.		
	B) Constructed from TALE proteins and nucleases.		
	C) Less efficient than CRISPR-Cas9.		
	D) Used primarily for gene silencing		
Q 15	Which genome editing tool uses an RNA-guided DNA	1.5	CO4
	endonuclease system?		
	A) ZFNs B) TALENs C) CRISPR-Cas9 D) Cre-loxP system		
Q 16	When designing a gene transfer experiment, scientists must	1.5	CO4
	consider:		
	A) The type of gene being transferred		
	B) The target organism		
	D) All of the above		
0.17	What is the primary role of Zinc Finger Nucleases (ZFNs) in	1.5	CO5
X - /	genome editing?	1.0	000
	A) To promote gene expression		
	B) To cut DNA at specific sites		
	C) To introduce mutations into RNA		
	D) To inhibit protein synthesis		
Q 18	Introduction of DNA into cells by exposing to high voltage	1.5	CO5
	electric pulse is		
	(A) electrofusion (B) electrofision (C) electrolysis		
	(D) electroporation		
Q 19	Which of the following is NOT a common application of gene	1.5	CO5
	transfer technology?		
	A) Production of therapeutic proteins		
	B) Gene therapy for genetic diseases		
	C) Creation of genetically modified organisms (GMOs)		
0.00	D) Identification of unknown genes	1.5	005
Q 20	which of the following is correct regarding genomics?	1.5	
	(A) It includes mapping of the genome		
	(B) It includes genome sequencing		
	(C) It includes genome analysis		
	(D) All of these		

Section B				
(4Qx5M=20 Marks)				
0.1		~	0.01	
Q 1	Describe DNA polymerase and its types.	5	CO1	
Q 2	List different types of viral vectors and their applications	5	CO2	
Q 3	Describe the principle of the CaCl ₂ -mediated transformation.	5	CO3	
Q 4	Explain the principle of qPCR and discuss the advantage of the	5	CO3	
	Taqman probe chemistry over SYBR green chemistry			
	Section C			
	(2Qx15M=30 Marks)			
Q 1	If you are involved in a project to develop a transgenic plant	15	CO2	
	with pest resistance, how would you create it using	(5+5+5)		
	recombinant DNA technology?			
	A. Explain the transgene and vector you would select for			
	the project and why.			
	B. Explain the preferred gene transfer method and why.			
	C. What molecular method you would apply to screen for			
	transgenic plant selection?			
Q 2	A biotech industry would like to generate a Flavor Savor	15	CO5	
	Tomato with a delayed ripening time, allowing for better	(5+5+5)		
	shipping and storage without losing flavor.			
	A. Explain an appropriate genetic modification tool that			
	can be utilized in creating Flavor Savor Tomato.			
	B. Discuss the appropriate vector for transferring the			
	gene responsible for delayed ripening into tomato			
	plants with justification.			
	C. Evaluate the suitable gene transfer methods that can be			
	employed in developing Flavor Savor Tomato.			
Section D				
(2Qx10M=20 Marks)				
Q 1	Differentiate the differences between CRISPR-Cas9,	10	CO2	
	TALENS, and ZFN as genetic modification tools in a tabular			
	format.			
Q 2	Explain the principle and procedure of agrobacterium-	10	CO4	
	mediated gene delivery with an illustration			