

Q 6	<p>What is the term used to describe unintended changes in the genome caused by editing techniques?</p> <p>A) Off-target effects B) Silent mutations C) Gene silencing D) Somatic variation</p>	1.5	CO2
Q 7	<p>A selectable marker gene in a gene transfer vector allows scientists to:</p> <p>A) Identify the specific gene of interest B) Select cells that have successfully taken up the vector C) Increase the copy number of the foreign DNA D) Modify the expression level of the foreign gene</p>	1.5	CO2
Q 8	<p>Which of the following is not a genome editing tool?</p> <p>A) CRISPR-Cas9 B) TALENs C) Zinc Finger Nucleases (ZFNs) D) RNA interference (RNAi)</p>	1.5	CO2
Q 9	<p>Which of the following is true about Zinc Finger Nucleases (ZFNs)?</p> <p>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.</p>	1.5	CO3
Q 10	<p>In the CRISPR-Cas9 system, what is the role of the guide RNA (gRNA)?</p> <p>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.</p>	1.5	CO3
Q 11	<p>Which of the statement hold true for quantitative PCR?</p> <p>(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 nature</p>	1.5	CO3
Q 12	<p>Viruses can be used as gene transfer vectors because they:</p> <p>A) Can efficiently introduce DNA into host cells B) Replicate rapidly within the host C) Can integrate their DNA into the host genome D) All of the above</p>	1.5	CO3

Q 13	<p>What is the Cas9 protein in the CRISPR system responsible for?</p> <p>A) Identifying the target DNA sequence B) Delivering the guide RNA to the nucleus C) Replicating the edited DNA D) Repairing the double-strand break</p>	1.5	CO4
Q 14	<p>TALENs are:</p> <p>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</p>	1.5	CO4
Q 15	<p>Which genome editing tool uses an RNA-guided DNA endonuclease system?</p> <p>A) ZFNs B) TALENs C) CRISPR-Cas9 D) Cre-loxP system</p>	1.5	CO4
Q 16	<p>When designing a gene transfer experiment, scientists must consider:</p> <p>A) The type of gene being transferred B) The target organism C) The desired level of gene expression D) All of the above</p>	1.5	CO4
Q 17	<p>What is the primary role of Zinc Finger Nucleases (ZFNs) in genome editing?</p> <p>A) To promote gene expression B) To cut DNA at specific sites C) To introduce mutations into RNA D) To inhibit protein synthesis</p>	1.5	CO5
Q 18	<p>Introduction of DNA into cells by exposing to high voltage electric pulse is</p> <p>(A) electrofusion (B) electrofision (C) electrolysis (D) electroporation</p>	1.5	CO5
Q 19	<p>Which of the following is NOT a common application of gene transfer technology?</p> <p>A) Production of therapeutic proteins B) Gene therapy for genetic diseases C) Creation of genetically modified organisms (GMOs) D) Identification of unknown genes</p>	1.5	CO5
Q 20	<p>Which of the following is correct regarding genomics?</p> <p>(A) It includes mapping of the genome (B) It includes genome sequencing (C) It includes genome analysis (D) All of these</p>	1.5	CO5

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