


Name:			
Enrolment No:			
UPES End Semester Examination, December 2023			
Course: Introduction to Biotechnology Program: B.Tech Biotechnology Course Code: HSBT1001		Semester : I Duration : 3 Hours Max. Marks: 100	
Instructions: Attempt all questions			
S. No.	Section A: Short answer questions/ MCQ/T&F (20Qx1.5M= 30 Marks)	Marks	COs
Q 1	What is the main purpose of a bioreactor in cell culture and fermentation processes? a) To provide a controlled environment for cell growth and product formation b) To sterilize the culture medium c) To filter out impurities from the culture d) To analyze the genetic material of the cells	1.5	CO1
Q 2	What is the primary difference between recombinant DNA and genomic DNA? a) Recombinant DNA is artificially created by combining DNA from different sources, while genomic DNA is the total DNA of an organism. b) Genomic DNA is used in genetic engineering, while recombinant DNA is found in natural organisms. c) Recombinant DNA is found in human cells, while genomic DNA is found in bacterial cells. d) Genomic DNA is used in pharmaceutical production, while recombinant DNA is used in agriculture.	1.5	CO1
Q 3	What is the primary function of reverse transcriptase, an enzyme commonly found in retroviruses like HIV? a) It replicates DNA from RNA templates b) It repairs damaged DNA strands c) It catalyzes the breakdown of RNA molecules d) It helps RNA polymerase initiate transcription	1.5	CO1
Q 4	What role do trace elements, such as iron and zinc, play in microbial growth and metabolism? a) They are essential cofactors for enzymes and are involved in various metabolic reactions b) They act as inhibitors of microbial growth c) They are primarily structural components of the cell wall	1.5	CO1

	d) They are required for the synthesis of nucleic acids		
Q 5	Which technique in genetic engineering involves the separation of DNA fragments based on their size by applying an electric field? a) Polymerase Chain Reaction (PCR) b) DNA cloning c) Gel electrophoresis d) Reverse transcription	1.5	CO1
Q 6	What is the term for the practice of introducing a weakened or non-pathogenic form of a pathogen to stimulate an immune response and provide immunity? a) Antibiotic therapy b) Gene therapy c) Vaccination d) Chemotherapy	1.5	CO2
Q 7	In agriculture, what is the main function of biopesticides? a) To improve soil quality b) To enhance crop yields c) To control pests using naturally derived substances d) To modify plant genomes	1.5	CO2
Q 8	How does biodegradation contribute to environmental conservation? a) By enhancing climate change b) By accelerating the decomposition of waste materials c) By increasing the use of non-renewable resources d) By promoting deforestation	1.5	CO2
Q 9	The genetically modified brinjal in India has been developed for a) Drought resistance b) Enhancing mineral content c) Enhancing shelf life d) Insect resistance	1.5	CO2
Q 10	How does gene therapy contribute to the treatment of genetic disorders? a) It replaces all of a patient's existing genes with healthy ones. b) It prevents the occurrence of genetic disorders. c) It introduces functional genes into a patient's cells to correct defective ones. d) It targets infectious pathogens within the body.	1.5	CO2
Q 11	What is the primary concern associated with the potential misuse of biotechnology in creating bioweapons? a) Economic disparities b) Ethical dilemmas c) Bioterrorism d) Genetic discrimination	1.5	CO3

Q 12	<p>When considering the social implications of genetic testing and personalized medicine, what is the primary concern related to genetic discrimination?</p> <p>a) Privacy violations b) Equal access to healthcare c) Scientific accuracy d) Genetic diversity</p>	1.5	CO3
Q 13	<p>In plant tissue culture, what is the term for the process of taking a small piece of plant tissue and stimulating it to develop into a whole plant under controlled conditions?</p> <p>a) Somatic embryogenesis b) Zygote formation c) Meiosis d) DNA sequencing</p>	1.5	CO3
Q 14	<p>What is the significance of a "callus" in plant tissue culture?</p> <p>a) It is a plant disease b) It is a culture medium for microorganisms c) It is a mass of undifferentiated plant cells that can be used to regenerate whole plants d) It is a type of tissue used for DNA extraction</p>	1.5	CO3
Q 15	<p>What is the primary goal of developing animal cell lines in tissue culture?</p> <p>a) To generate electricity b) To provide a source of cells for research and the production of biological products c) To sterilize the culture medium d) To analyze the genetic material of the cells</p>	1.5	CO3
Q 16	<p>In molecular cloning, what is the role of a plasmid vector?</p> <p>a) To amplify DNA sequences b) To cut DNA at specific recognition sites c) To clone and replicate foreign DNA fragments d) To analyze proteins</p>	1.5	CO4
Q 17	<p>Which enzyme is used in PCR to synthesize a complementary strand of DNA from a template strand?</p> <p>a) DNA polymerase b) RNA polymerase c) Restriction enzyme d) Ligase enzyme</p>	1.5	CO4
Q 18	<p>In gas chromatography (GC), what is the mobile phase?</p> <p>a) A liquid solvent b) A solid stationary phase c) A inert gas d) A gel matrix</p>	1.5	CO4

Q 19	<p>What is the primary principle behind centrifugation techniques used in biotechnology?</p> <p>a) Separation of molecules based on charge b) Separation of molecules based on size c) Separation of molecules based on their interactions with a stationary phase d) Detection of molecular structure</p>	1.5	CO4
Q 20	<p>What is the term for the technique used to examine the distribution of molecules in a sample based on their electrical charge and size?</p> <p>a) Light microscopy b) Fluorescence microscopy c) Electrophoresis d) Phase-contrast microscopy</p>	1.5	CO4
Section B: Short-Answer Questions (4Qx5M=20 Marks)			
Q 1	Name any two biotechnology products that have commercial importance. What are the challenges associated with biotech sector in India?	5	CO1
Q 2	Explain the process of translation, highlighting the role of ribosomes, tRNA, and mRNA in protein synthesis. How are amino acids assembled into a functional protein during translation?	5	CO2
Q 3	How do scientists maintain the sterility of cell cultures, and what are the challenges in animal tissue culture?	5	CO3
Q 4	What are the potential environmental and health impacts of GMOs, and how do regulatory agencies address these concerns while promoting biotechnological advancements?	5	CO4
Section C: Case study (2Qx15M=30 Marks)			
Q 1	<p>In the early 1990s, the Calgene company, a biotechnology firm, aimed to create a tomato with a longer shelf life and improved flavor by using genetic engineering techniques. The result was the Flavr Savr tomato, engineered to resist overripening and provide consumers with a tastier, longer-lasting fruit. The Flavr Savr tomato's genetic modification involved suppressing a gene responsible for the production of the enzyme polygalacturonase, which breaks down pectin and softens the fruit. By delaying the softening process, the tomato remained firm and flavorful for an extended period, improving its shelf life.</p> <p>Based on this case study, answer the following questions: A) Describe the background and development of the Flavr Savr tomato. What were the specific goals behind creating this genetically modified tomato, and how was it engineered to achieve these goals?</p>	15 marks (5 marks each)	CO2

	<p>B) Discuss the significance of the Flavr Savr tomato as one of the first genetically modified crops to receive regulatory approval.</p> <p>C) What were the key ethical and safety concerns raised by critics and the public regarding the Flavr Savr tomato and genetically modified foods in general? How did these concerns impact the acceptance of GM foods?</p>		
Q 2	<p>Dolly was cloned by a team of scientists at the Roslin Institute in Scotland, led by Dr. Ian Wilmut. The cloning technique involved transferring the nucleus of an adult sheep's udder cell into an enucleated egg cell, which was then stimulated to develop into an embryo and placed in a surrogate mother. Dolly's creation demonstrated that it was possible to clone an adult mammal, overturning the conventional wisdom that cloning was only feasible from embryonic cells. This opened the door to numerous possibilities in genetic engineering and biotechnology.</p> <p>Based on this case study, answer the following questions:</p> <p>A) Describe the scientific breakthrough achieved by the team at the Roslin Institute in the creation of Dolly the Sheep. What was the novel technique used, and how did it differ from previous cloning methods?</p> <p>B) Explain the significance of Dolly's successful cloning in the context of genetic engineering and biotechnology. How did it challenge existing scientific paradigms?</p> <p>C) How did Dolly's case contribute to advancements in animal cloning and its applications, such as livestock breeding and medical research?</p>	15 marks (5 marks each)	CO4
<p>Section D: Long-Answer Questions (2Qx10M=20 Marks)</p>			
Q 1	<p>a) Explain the principles of animal tissue culture and its importance in biomedical research. How do scientists use animal cell cultures to study diseases and develop therapies?</p> <p>b) Explore the ethical considerations and regulatory aspects of animal tissue culture</p>	5+5	CO3
Q 2	<p>a) Discuss the role of bioprocess optimization in achieving high yields and product quality.</p> <p>b) What strategies and parameters are typically considered during the optimization of bioprocesses?</p>	5+5	CO5