


<b>Name:</b>			
<b>Enrolment No:</b>			
<b>UPES</b> <b>End Semester Examination, December 2024</b>			
<b>Course: Introduction to Biotechnology</b>		<b>Semester : I</b>	
<b>Program: B.Tech Biotechnology</b>		<b>Duration : 3 Hours</b>	
<b>Course Code: HSBT1004</b>		<b>Max. Marks: 100</b>	
<b>Instructions: Attempt all questions</b>			
S. No.	Section A Short answer questions/ MCQ/T&F (20Qx1.5M= 30 Marks)	Marks	COs
Q 1	Who is known as the "Father of Biotechnology"? a) Gregor Mendel b) Louis Pasteur c) Károly Ereky d) Alexander Fleming	1.5	CO1
Q 2	Which organelle contains hydrolytic enzymes? a) Lysosome b) Vacuole c) Golgi apparatus d) Endoplasmic reticulum	1.5	CO1
Q 3	Which phase of microbial growth is characterized by exponential cell division? a) Lag phase b) Log phase c) Stationary phase d) Death phase	1.5	CO1
Q 4	Which of the following is considered an ancient biotechnology practice? a) DNA sequencing b) Fermentation for brewing beer c) Genetic engineering of crops d) PCR (Polymerase Chain Reaction)	1.5	CO1
Q 5	Which branch of biotechnology focuses on the industrial production of enzymes and biofuels? a) Medical biotechnology b) Environmental biotechnology c) Industrial biotechnology d) Agricultural biotechnology	1.5	CO1
Q 6	During replication, which enzyme unwinds the DNA helix?	1.5	CO2

	<ul style="list-style-type: none"> <li>a) Ligase</li> <li>b) Helicase</li> <li>c) Primase</li> <li>d) Topoisomerase</li> </ul>		
Q 7	<p>In prokaryotes, transcription and translation occur:</p> <ul style="list-style-type: none"> <li>a) Simultaneously</li> <li>b) Sequentially, in different locations</li> <li>c) Only during cell division</li> <li>d) Within the nucleus</li> </ul>	1.5	CO2
Q 8	<p>Which is the most commonly used host organism in recombinant DNA technology?</p> <ul style="list-style-type: none"> <li>a) Yeast</li> <li>b) Escherichia coli</li> <li>c) Fruit flies</li> <li>d) Tobacco plants</li> </ul>	1.5	CO2
Q 9	<p>Which is a part of the innate immune system?</p> <ul style="list-style-type: none"> <li>a) Antibodies</li> <li>b) Skin barrier</li> <li>c) T cells</li> <li>d) Plasma cells</li> </ul>	1.5	CO2
Q 10	<p>What is the purpose of GMOs in agriculture?</p> <ul style="list-style-type: none"> <li>a) To increase yield and resistance to pests</li> <li>b) To prevent climate change</li> <li>c) To eliminate the need for fertilizers</li> <li>d) To grow crops faster</li> </ul>	1.5	CO2
Q 11	<p>Somatic hybridization involves the fusion of:</p> <ul style="list-style-type: none"> <li>a) Two somatic cells</li> <li>b) Somatic and gametic cells</li> <li>c) Two gametic cells</li> <li>d) A cell and its nucleus</li> </ul>	1.5	CO3
Q 12	<p>What is a Ti plasmid?</p> <ul style="list-style-type: none"> <li>a) A bacterial plasmid used in animal cell transformation</li> <li>b) A vector derived from Agrobacterium tumefaciens</li> <li>c) A viral genome used in plant transformation</li> <li>d) None of the above</li> </ul>	1.5	CO3
Q 13	<p>What do you mean by callus culture?</p>	1.5	CO3
Q 14	<p>Which gene is commonly used in genetically modified crops for herbicide resistance?</p> <ul style="list-style-type: none"> <li>a) Cry gene</li> <li>b) EPSPS gene</li> <li>c) Ribosomal gene</li> <li>d) GFP gene</li> </ul>	1.5	CO3
Q 15	<p>What is the function of the Cry protein in Bt crops?</p> <ul style="list-style-type: none"> <li>a) To increase growth rate</li> </ul>	1.5	CO3

	b) To kill insect pests c) To improve nutritional value d) To enhance photosynthesis		
Q 16	Which technique is used to determine the nucleotide sequence of DNA? a) PCR b) Sanger sequencing c) Southern blotting d) ELISA	1.5	CO4
Q 17	Which active ingredient in turmeric is responsible for its medicinal properties? a) Curcumin b) Quinine c) Resveratrol d) Lycopene	1.5	CO4
Q 18	Which method uses fluorescent dyes to monitor DNA amplification in real-time? a) Conventional PCR b) RT-PCR c) qPCR d) ELISA	1.5	CO4
Q 19	Define GMOs. Give an example of a transgenic plant.	1.5	CO4
Q 20	The production of secondary metabolites requires the use of (a) Meristem culture (b) Protoplast culture (c) Axillary buds culture (d) Cell suspension culture	1.5	CO4
<b>Section B: Short-Answer Questions (4Qx5M=20 Marks)</b>			
Q 1	With the help of an example, discuss the importance of rDNA technology in the field of medicine?	5	CO1
Q 2	Define macromolecules? Discuss four major types of macromolecules and their function.	5	CO2
Q 3	Write a short note on animal cell culture. Provide an example of a genetically modified animal and its benefits.	5	CO3
Q 4	What are GMOs. List the advantages and concerns associated with GMOs.	5	CO4
<b>Section C: Case study (2Qx15M=30 Marks)</b>			
Q 1	Bt cotton, a genetically modified (GM) crop, has been engineered to produce a toxin (Cry protein) from the bacterium <i>Bacillus thuringiensis</i> (Bt). This toxin targets common pests like the bollworm, reducing crop damage and the need for chemical	15 marks (5 marks each)	CO2

	<p>pesticides. Since its commercialization in 1996, Bt cotton has significantly increased yields, particularly in pest-prone regions such as India and parts of Africa</p> <p>Based on your understanding of GM crops, answer the following questions:</p> <p>A) Discuss the primary genetic modification in Bt cotton, and how does it benefit the crop?</p> <p>B) Explain the environmental advantages of Bt cotton compared to conventional varieties. Discuss the economic impact of Bt cotton on small-scale farmers.</p> <p>C) Describe challenges or concerns that have emerged with the adoption of Bt cotton?</p>		
Q 2	<p>Dr. Ananda Chakrabarty is most famous for his groundbreaking work in the 1970s when he successfully genetically engineered a new strain of <i>Pseudomonas</i> bacteria capable of breaking down crude oil. This development had enormous potential for environmental cleanup, particularly in the context of oil spills. His creation of this genetically modified microorganism led to the granting of the first-ever patent on a living organism by the United States Patent and Trademark Office (USPTO) in 1980.</p> <p>Answer the following questions:</p> <p>A) What was Dr. Ananda Chakrabarty's groundbreaking achievement in the field of biotechnology, and why was it significant in the context of environmental cleanup?</p> <p>B) Discuss the key steps involved in developing recombinant bacteria with desired characteristics?</p> <p>C) List the potential benefits and risks of using genetically modified organisms (GMOs) for environmental cleanup?</p>	15 marks (5 marks each)	CO3
<p><b>Section D: Long-Answer Questions</b> (2Qx10M=20 Marks)</p>			
Q 1	<p>a) Discuss the role of <i>Agrobacterium tumefaciens</i> in plant transformation?</p> <p>b) Mention any three chemical gene transfer methods that are used to introduce recombinant DNA into a competent host cell.</p>	5+5 marks	CO3
Q 2	<p>Explain the role of bioinformatics in drug design, emphasizing computational techniques and databases used in identifying drug targets and designing novel drugs.</p> <p style="text-align: center;">OR</p> <p>Explain the concept of biopharmaceuticals and discuss their production methods, with a focus on recombinant DNA technology and the role of expression systems (e.g., bacteria, yeast, mammalian cells).</p>	10 marks	CO4