

Name:  
Enrolment No:



**UNIVERSITY OF PETROLEUM AND ENERGY STUDIES**  
**End Semester Examination, December 2021**

**Course: Introduction to Biotechnology**  
**Program: B.Tech Biotechnology**  
**Course Code: HSBT1001**  
**Instructions:**

**Semester: I**  
**Duration: 03 hrs.**  
**Max. Marks: 100**

	<b>SECTION A</b> <b>(Type the answers in test box)</b>	<b>(20Q x1.5M= 30 Marks)</b>	<b>CO</b>
	<b>MCQs or Fill in the blanks</b>		
Q1	Application of biotechnology procedures in medical processes is classified as. a) White biotechnology b) Red biotechnology c) Blue biotechnology d) Green biotechnology	<b>1.5</b>	<b>CO1</b>
Q2	The DNA of an elephant and the DNA of a mango tree will probably differ in all of the following except a) A sequence of DNA nucleotides b) Length of DNA molecules c) Number of DNA molecules d) Kinds of nucleotides utilized in forming DNA	<b>1.5</b>	<b>CO1</b>
Q3	Biotechnology has contributed to the field of a) Health b) Pharmacy c) Agriculture d) All of the above	<b>1.5</b>	<b>CO1</b>
Q4	Process of using living organisms to develop products is known as a) Genome engineering b) Medical engineering c) Biotechnology d) Bioengineering	<b>1.5</b>	<b>CO1</b>
Q5	Restriction enzymes were discovered by a) Smith and Nathans b) Alexander Fleming c) Berg	<b>1.5</b>	<b>CO2</b>

	d) None		
Q6	Plasmids are used in genetic engineering because they a) are easily available b) can replicate c) can integrate with hosts chromosome d) are inert	1.5	CO2
Q7	Which of the following enzyme is used to join bits of DNA? a) Ligase b) Primase c) DNA polymerase d) Endonuclease	1.5	CO2
Q8	The genetically engineered Golden Rice synthesizes large amount of a) Vitamin C b) B-carotene and ferritin c) Biotin d) Lysine	1.5	CO2
Q9	Transgenic plants are developed by a) Introducing foreign genes b) Introducing gene mutations c) Deleting certain chromosomes parts d) Stopping spindle formation	1.5	CO3
Q10	Cry genes or Bt genes are obtained from a) Cotton pest b) Tobacco plant c) <i>Bacillus thuringiensis</i> d) <i>E. Coli</i>	1.5	CO3
Q11	What is plant tissue culture? a) The technique of in vitro maintaining and growing cells b) The technique of in vivo growing cells c) The technique of growing plants in gardens d) The technique of cutting plants	1.5	CO3
Q12	Essential requirement of an artificial medium in which explant is being regenerated is _____ a) the medium should have a sulphur source b) the medium should have very low carbon concentration c) the medium must provide a carbon source d) the medium must provide a nitrogen donor	1.5	CO3
Q13	Which of the following plant part is free from the attack of the virus?	1.5	CO4

	<ul style="list-style-type: none"> <li>a) Stem</li> <li>b) Root</li> <li>c) Meristem</li> <li>d) Leaves</li> </ul>		
Q14	<p>“The material used in culture techniques is important because the surface of the vessel serves as a substrate for cells to grow”. Please select the right choice and justify the reason for your answer</p> <ul style="list-style-type: none"> <li>a) True</li> <li>b) False</li> </ul>	<b>1.5</b>	<b>CO4</b>
Q15	<p>_____ is the advantage of animal tissue culture</p> <ul style="list-style-type: none"> <li>a) It is cost-effective</li> <li>b) No skilled personnel is required</li> <li>c) Tissue cultures can be stored for a long time</li> <li>d) Maintenance of environmental conditions is easy</li> </ul>	<b>1.5</b>	<b>CO4</b>
Q16	<p>Which of the following are not the application of bioinformatics?</p> <ul style="list-style-type: none"> <li>a) Drug designing</li> <li>b) Data storage and management</li> <li>c) Understand the relationships between organisms</li> <li>d) None of the above</li> </ul>	<b>1.5</b>	<b>CO4</b>
Q17	<p>An example of homology and similarity tool</p> <ul style="list-style-type: none"> <li>a) PROSPECT</li> <li>b) PDB</li> <li>c) RASMOL</li> <li>d) BLAST &amp; FASTA</li> </ul>	<b>1.5</b>	<b>CO5</b>
Q18	<p>Which of the following factors is not responsible for the denaturation of proteins?</p> <ul style="list-style-type: none"> <li>a) Heat</li> <li>b) Charge</li> <li>c) pH change</li> <li>d) Organic solvents</li> </ul>	<b>1.5</b>	<b>CO5</b>
Q19	<p>Which of the following statements is true about proteins?</p> <ul style="list-style-type: none"> <li>a) Proteins are made of amino acids.</li> <li>b) Proteins are essential for the development of skin, teeth and bones.</li> <li>c) Protein is the only nutrient that can build, repair and maintain body tissues.</li> <li>d) All of the above</li> </ul>	<b>1.5</b>	<b>CO5</b>
Q20	<p>GEAC makes decisions regarding the validity and the safety of _____ organisms.</p> <ul style="list-style-type: none"> <li>a) genetically modified</li> </ul>	<b>1.5</b>	<b>CO5</b>

	b) dead c) damaged d) infected		
	<b>SECTION B (Scan and upload)</b>	<b>(4Qx5M=20 Marks)</b>	<b>CO</b>
Q1	a) Identify any food item that is currently modified by biotechnology. b) Discuss two advantages and two concerns pertaining to applying biotechnology to this food.	<b>1 + 4</b>	<b>CO1</b>
Q2	a) Discuss key tools of rDNA technology. b) List any three commercial products made by recombinant technology.	<b>2.5 + 2.5</b>	<b>CO2</b>
Q3	What is microbial cell culture? Differentiate between pour plate method and spread plate method of culturing. OR A scientist wants 16,000/ml <i>E.coli</i> cells for his molecular biology experiment; he has inoculated 1000 cells at around 8:00PM. The generation time of <i>E.coli</i> is 20 mins. What is the harvesting time of the culture?	<b>5</b>	<b>CO3</b>
Q4	What is Sequence alignment? Differentiate between global & local alignment. List two most popular sequence alignment tools.	<b>5</b>	<b>CO4</b>
	<b>SECTION C (Scan and upload)</b>	<b>(2Qx15M=30 Marks)</b>	<b>CO</b>
Q1	Bt cotton is an insect-resistant transgenic crop designed to combat the bollworm. Bt cotton was created by genetically altering the cotton genome to express a microbial protein from the bacterium <i>Bacillus thuringiensis</i> . In short, the transgene inserted into the plant's genome produces toxin crystals that the plant would not normally produce which, when ingested by a certain population of organisms, dissolves the gut lining, leading to the organism's death. The introduction of Bt cotton led to a dramatic increase in production across the cotton producing states and soon Bt cotton took over most of the acreage under cotton cultivation. Cotton production rose from 14 million bales in the pre-Bt year of 2001-'02 to 39 million bales in 2014-'15, a rise of almost 180%. India's cotton imports fell, export grew and in 2015-16 have overtaken China as the biggest cotton producer in the world. farmers and food activists have been protesting for the past decade on various ground such as cost, diffusion of illegal Bt hybrids that hadn't been cleared for bio safety standards, leading to fears of environmental toxicity and seeds cannot be reused and farmers need to buy new stock for every growing season. This, along with licensing agreements with local seed companies, has given Monsanto a near monopoly on cotton seeds in India that has been the biggest worry for activists.	<b>15 (3 marks each)</b>	<b>CO3</b>

	<p>Based on this case study, answer the following:</p> <ol style="list-style-type: none"> <li>What is Bt-cotton and why do we need to produce this GM crop</li> <li>Which technology was used to produce Bt-cotton?</li> <li>How is Bt-cotton made?</li> <li>How Bt-cotton changed Indian cotton industry?</li> <li>Why Bt-cotton is facing failure in India?</li> </ol>		
Q2	<p>Different types of vaccines work in different ways to offer protection. But with all types of vaccines, the body is left with a supply of “memory” T-lymphocytes as well as B-lymphocytes that will remember how to fight that virus in the future. Currently, there are three main types of COVID-19 vaccines that are approved or authorized for use in the United States or that are undergoing large-scale (Phase 3) clinical trials in the United States. First type is mRNA vaccines contain material from the virus that causes COVID-19 that gives our cells instructions for how to make a harmless protein that is unique to the virus. After our cells make copies of the protein, they destroy the genetic material from the vaccine. Our bodies recognize that the protein should not be there and build T-lymphocytes and B-lymphocytes that will remember how to fight the virus that causes COVID-19 if we are infected in the future. Both the Pfizer-BioNTech and the Moderna COVID-19 vaccines use mRNA. Second type is protein subunit vaccines include harmless pieces (proteins) of the virus that causes COVID-19 instead of the entire germ. Once vaccinated, our bodies recognize that the protein should not be there and build T-lymphocytes and antibodies that will remember how to fight the virus that causes COVID-19 if we are infected in the future. Novavax is working on a protein subunit COVID-19 vaccine. Third type is vector vaccines contain a modified version of a different virus than the one that causes COVID-19. Inside the shell of the modified virus, there is material from the virus that causes COVID-19. This is called a “viral vector.” Once the viral vector is inside our cells, the genetic material gives cells instructions to make a protein that is unique to the virus that causes COVID-19. Using these instructions, our cells make copies of the protein. This prompts our bodies to build T-lymphocytes and B-lymphocytes that will remember how to fight that virus if we are infected in the future. Viral vector vaccines can't cause you to become infected with the COVID-19 virus or the viral vector virus. Also, the genetic material that's delivered doesn't become part of your DNA. The Janssen/Johnson &amp; Johnson COVID-19 vaccine is a vector vaccine. AstraZeneca and the University of Oxford also have a vector COVID-19 vaccine.</p> <p>Based on the above information, please answer the following:</p>	<b>15 (5 marks each)</b>	<b>CO4</b>

	<p>a) What is a vaccine and how does it work in our body?</p> <p>b) Which three types of Covid-19 vaccines are described in the above description?</p> <p>c) Describe how different technologies work with the immune system to provide protection against virus</p>		
	<p><b>SECTION- D</b> <b>(Scan and upload)</b></p>	<p><b>(2Qx10M=20 Marks)</b></p>	<p><b>CO</b></p>
	<b>Long Answer type Question</b>		
Q1	<p>a) What is the role of <i>Agrobacterium tumefaciens</i> in plant transformation?</p> <p>b) Mention any three physical gene transfer methods that are used to introduce recombinant DNA into a competent host cell.</p>	<p><b>10 (5 marks each)</b></p>	<p><b>CO3</b></p>
Q2	<p>a) What are the objectives of Biotech patenting? List two patentable and non-patentable biotechnological inventions.</p> <p>b) What is Bioethics? Discuss the statement “The Patents Act states that the use of human embryos for industrial and commercial purposes” must be excluded from patentability”</p> <p>c) How are GM crops regulated?</p>	<p><b>10 (4+3+3 marks each)</b></p>	<p><b>CO5</b></p>