

NATIONAL INSTITUTE OF TECHNOLOGY DURGAPUR**Odd Semester Mid-term Examination, 2023-24**

Course Code: BTE711

Full Marks: 25

Course Name: Cancer Biology and Cell Signaling

Time: 90 minutes

Instructions: Answer all the questions.

Question No.	Body of the Question	Marks	Mapped CO
PART A			
1	a. What is the unique characteristic of DNA Polymerase alpha? b. What is DNA polymerase switching? c. What is the role of DNA Polymerase delta? d. What is the role of DNA polymerase beta? e. What is the role of DNA Polymerase Gamma?	1+2+2+2+1=8	CO1, CO2
2	a. What is a Klenow fragment? b. What is the role of the Exonuclease activity of the DNA pol and what type of exonuclease activity it has? c. AP endonuclease involved in what kind of DNA repair? d. Xeroderma pigmentosum, the human skin cancer caused due to what kind of DNA repair?	1+3+1+2=7	CO1, CO2
PART B			
3	What are signaling cells and target cells? What are paracrine and endocrine signaling? What is janus kinase? How it is activated?	1+1+1+1+1=5	CO1, CO4
4	What is a cell surface receptor? How the receptor sends the signal inside the cell? What is the difference between a tyrosine kinase and a serine kinase? How the kinases and phosphatases are involved in a switch on/switch off process of a signaling molecule?	1+1+1+2=5	CO1, CO4

Course Outcomes

- CO1: To understand the basic concepts of cancer biology and related cellular signaling
- CO2: To understand the development and causes of cancer.
- CO3: To understand the therapeutic aspects of cancer prevention
- CO4: To identify the target molecules that are associated with cancer so that the cancer preventive small molecule inhibitors/phytochemicals can be screened.

NATIONAL INSTITUTE OF TECHNOLOGY DURGAPUR**Odd Semester Mid-Term Examination, 2023-24****Course Code:** BTE 712

Full Marks: 25

Course Name: FOOD BIOTECHNOLOGY

Time: 90 Minutes

Instructions: Answer all the questions.

Question No.	Body of the Question	Marks	Mapped CO
1	Explain why <i>S. cerevisiae</i> is unable to utilize xylose for ethanol production. What strategies can be developed to utilize xylose through metabolic engineering?	1+4	CO3
2	With the help of a flow chart explain the process of brewing of beer.	8	CO2
3	Ethyl Carbamate is an off flavor compound is wine fermentation. How would you remove the ethyl carbamate production using allele replacement? Explain it with a diagram.	4	CO3
4	What are the limitations of genetic engineering in wine yeast?	3	CO3
5	How would you reduce the maturation period in beer fermentation using genetic engineering approach?	5	CO3

Course Outcomes

CO1:

CO2: Q2

CO3: Q1, Q3, Q4, Q5

CO4:

NATIONAL INSTITUTE OF TECHNOLOGY DURGAPUR
Odd Semester Mid-Term Examination, 2023-24

Course Code: BTE718

Full Marks: 25

Course Name: Proteomics and Protein Engineering

Time: 90 Minutes

Instructions: Answer all the questions.

Q. No.	Questions	Marks	Mapped CO
1	pKa values of carboxy, amino and side chain groups of Glu are 2.1, 9.5, and 4.1 respectively. Determine the pI of Glu. Draw the titration curve of Glu and mark the pKa and pI values on the curve. Show the ionization status of the amino acid at different pKa and pI values.	2 + 1 + 3 = 6	CO1
2	Name 5 highly hydrophobic amino acids found in proteins. What is hydropathy plot and how is it useful in understanding protein function?	2.5 + 2.5 = 5	CO1
3	Discuss the principle of Edman degradation. How Sanger used this technique to deduce the primary structure of insulin?	3 + 2 = 5	CO1
4	State one advantage and one disadvantage of NMR based protein structure determination.	2	CO1
5	Ser is an amino acid which can be modified by phosphorylation. Why is this modification important for protein structure and function?	2	CO1
6	Fill in the blanks with appropriate word/s: a) _____ isomer of amino acids only participates in protein synthesis in all living organisms. b) _____ is one of the three least abundant amino acids in a typical proteins. c) _____ is an amino acid which has a net negative charge at physiological pH. d) G-aminobutyrate (GABA) is produced from _____ by the _____ reaction.	1 X 5 = 5	CO1

Course Outcomes

CO1: Students will acquire knowledge on protein structure and function and will be able to apply the understanding in designing strategies for proteomic analysis and protein engineering.

CO2: Students will be acquainted with tools and techniques for proteomic analysis and will be able to analyse proteomic data using databases.

CO3: Students will be acquainted with tools and techniques for protein engineering and will be able to apply them to solve problem related to protein function and efficiency.

NATIONAL INSTITUTE OF TECHNOLOGY DURGAPUR**Odd Semester Mid-Term Examination, 2023-24****Course Code:** BTE722

Full Marks: 25

Course Name: VACCINE TECHNOLOGY

Time: 90 Minutes

Instructions: Q1 is compulsory. Attempt 2 questions from Q2-4.

Question No.	Body of the Question	Marks	Mapped CO
1.	<p>ERVEBO® (Ebola Zaire Vaccine, Live also known as V920, rVSVΔG-ZEBOV-GP or rVSV-ZEBOV) is approved by the U.S. Food and Drug Administration (FDA) for the prevention of disease caused by Ebola virus (EBOV; species <i>Zaire ebolavirus</i>) in individuals 18 years of age and older as a single dose administration. ERVEBO is a replication-competent, live, attenuated recombinant vesicular stomatitis virus (rVSV) vaccine manufactured by Merck.</p> <p>i) Can you describe the terms used to describe the vaccine ERVEBO? ii) Can you draw a schematic diagram to explain how it was produced? iii) What would be the possible advantages and disadvantages of such a vaccine?</p>	4+4+3	CO2
2.	<p>i) Can a person be infected with the vaccine designed to protect the individual? – Elaborate with an example. ii) Define the term passive immunity. How would passive immunity be acquired?</p>	4+3	CO1
3.	<p>i) The familiar slogan "My Body, My Choice" is been recently used as an anti-vaccination drive. As a public health strategist, are you in favour of this argument? Discuss ii) Could you give three suggestions that could be employed to increase immunization coverage in a country like India?</p>	4+3	CO5
4.	<p>i) Inorganic compound like alum is used widely in vaccine formulation- Give reasons. Can you name two other compounds/chemicals that could be used for the same purpose? ii) Which of the following statements is/are correct? Elaborate</p> <p>a) Conjugate vaccines are effective in those most at risk (infants) and provide longer-term protection (everyone else) b) Polysaccharide vaccines are targeted, but not very immunogenic. They induce only short-term immunity. Polysaccharide vaccines do not provoke a sufficient immune response in infants and young children, but can in adults c) Conjugate vaccines bind the polysaccharide to a carrier protein. d) The measles vaccine is a typical example of a conjugate vaccine that provides better protection for infants compared to a polysaccharide vaccine.</p>	3+4	CO1

Course Outcomes

- CO1: To understand the factors that influence vaccine design and development
- CO2: To understand how research based discovery has driven vaccine development
- CO3: To know about the different types of vaccines
- CO4: To learn about the quality control and regulation in the vaccine production
- CO5: To understand the importance of vaccination as a public health strategy

NATIONAL INSTITUTE OF TECHNOLOGY DURGAPUR**Odd Semester Mid-Term Examination, 2023-24****Course Code:** BTE723

Full Marks: 25

Course Name: Stem Cell Biology

Time: 90 Minutes

Instructions: Answer all the questions.

Question No.	Body of the Question	Marks	Mapped CO
1	How the differential adhesion hypothesis of cell-cell interaction can be explained at the molecular level? What will happen if there is a concentration gradient of cell surface receptor/adhesion molecules in the basal and the apical region of a cell? In the same setting what would be the consequence of sudden expression of different type of adhesion molecules at the basal with respect to the apical region?	2+2+2=6	CO1
2	Explain reciprocal and sequential induction with respect to the concept of induction and competence. Explain with proper logic why additive induction is important in some cases? What can be developmental consequence of a sequential induction event gone wrong which involves cell proliferation step followed by a differentiation step?	3+3+2=8	CO1
3	How conditional specification is different from syncytial specification? What could be the molecular mechanism of action of the concentration gradient of a morphogen?	3+3=6	CO1
4	What are cortical granules and how can you trigger the cortical reaction artificially without actual fertilization in a laboratory condition? Explain what you mean by capacitation?	5	CO1

Course Outcomes

CO1: To understand the basic mechanisms of how cells differentiate into specific tissues in response to a variety of biologic signalling molecules and the use of such factors for tissue production in-vitro.

CO2: To acquire knowledge on the molecular basis of cellular and functional changes of different organs that occur in disease and treatments that cause tissue remodelling to correct these changes

CO3: To gather insights on how studies of the developmental, cellular and molecular biology of regeneration have led to the discovery of new drugs/therapy for regenerative therapy.

CO4: To understand the recent advances on application the regenerative therapy from well characterized case studies.

NATIONAL INSTITUTE OF TECHNOLOGY DURGAPUR
Odd Semester Mid-Term Examination, 2023-24

Course Code: BTE724

Full Marks: 25

Course Name: Applications of Molecular Cloning

Time: 90 Minutes

Instructions: Answer all the questions.

Q. No.	Questions	Marks	Mapped CO
1	How will you use an expression vector to achieve expression of a foreign gene in <i>E. coli</i> ? Explain with the help of a suitable diagram.	5	CO1
2	How will you differentiate between weak and strong promoters? Explain with the help of a suitable diagram.	5	CO1
3	Which basic methods would you apply to understand whether the gene of interest is integrated in the genome and then gets expressed across generations in the genetically modified crop plant? Explain.	5	CO2
4	What is mode of action of delta endotoxin? What strategies may be undertaken to counter development of insect resistance against delta endotoxin gene?	2 x 2.5	CO3
5	Discuss how can vaccinia virus be used to produce Hepatitis B surface antigen. Explain with the help of a suitable diagram.	5	CO4

Course Outcomes

CO1: To understand the fundamentals of molecular cloning

CO2: To learn the basic methods of molecular cloning.

CO3: To gain knowledge about the potential application aspects of molecular cloning

CO4: To build-up a bridging concept for extension of theoretical knowledge to practical applications of molecular cloning