

NATIONAL INSTITUTE OF TECHNOLOGY DURGAPUR
Even Semester Mid-term Examination, 2021-22

Course Code:BTC01

Course Name: Life Science

Question Paper No.: NITDGP/BTC01/Mid Sem

Full Marks: 25

Time: 90 Minutes

Date of Exam:03/06/2022

Instructions: Answer all the questions.

Question No.	Body of the Question	Marks	Mapped CO
1	Draw the schematic structure of a nucleus and describe the functions of various components of the nucleus.	2+5	CO1
2	Write the names of four types of signalling in multicellular organisms.	2	CO1
3	Describe the cytoskeletal elements and their functions.	4	CO1
4	What are carbohydrates? Classify carbohydrates based on the functional groups present. Give examples.	1+1+1	CO2
5	What are polysaccharides? Name two polysaccharides one each from plants and animals, which are stored forms of carbohydrates.	1+1	CO2
6	What are proteins? Draw the general structure of an amino acid.	1+1	CO2
7	Discuss the salient features of the structure of proteins.	5	CO2

Course Outcomes

- CO1: To be familiarized with the basic cellular organization of organisms and cellular communications.
 CO2: To impart an understanding about the basic structure and functions of the macromolecules and their biosynthesis and catabolism.
 CO3: To give an understanding of the key features of the structure, growth, physiology and behavior of bacteria, viruses, fungi and protozoa
 CO4: To introduce molecular biology to understand biological processes in various applications.
 CO5: To provide a foundation in immunological processes and an overview of the interaction between the immune system and pathogens.
 CO6: To provide knowledge about biological and biochemical processes that require engineering expertise to solve them

NATIONAL INSTITUTE OF TECHNOLOGY DURGAPUR**Even Semester End-term Examination, 2021-22****Course Code:** BTC401

Full Marks: 30

Course Name: Molecular Biology and rDNA Technology

Time: 90 Minutes

Question Paper No.: NITDGP/BTC401/

Date of Exam: 25/04/2022

Instructions: Answer **ALL** the questions.

Materials to be supplied: NA

Question No.	Body of the Question	Marks	Mapped CO
1	What is TATA box? What will be the consequence of a mutation in the TATA box?	3	CO3
2	Discuss the role of snRNPs in the synthesis of mRNA.	3	CO1
3	Imagine that genetic codes are 2 base letters instead of 3. Do you think such a situation can exist? Justify your answer.	3	CO3
4	By a flow chart discuss the steps at which expression of a gene can be regulated.	3	CO4
5	What are the E, P, and A sites? Discuss the function of each of these sites.	3	CO1
6	Sphaeroplast formation is essential for the separation of DNA on the basis of size: Explain how?	3	CO2
7	How will you check the purity of a DNA preparation? State one strategy to get a high yield of extracellular λ phages.	3	CO4
8	What will the specific requirement of the host cell while using T7 promoter as inducible promoter in the expression vector?	3	CO3
9	State the role of lysozyme, ethylenediamine tetraacetate (EDTA), and sodium dodecyl sulphate (SDS) in the preparation of cell extract.	3	CO2
10	What is PCR-based mutagenesis??	3	CO2

Course Outcomes

CO1: Students will acquire basic understanding of molecular biology topics: nucleic acid structure and chemistry; organization of genome in chromosomes; regulation of replication, transcription, translation and DNA repair.

CO2: Students will acquire knowledge of recombinant DNA techniques on: nucleic acid amplification and gene cloning; manipulation of DNA sequences; preparation and screening of nucleic acid libraries; gene silencing; analysis of variations in genome sequence.

CO3: Students will be proficient in applying basic understanding of molecular biology topics in analyzing and solving problems related to recombinant DNA technology.

CO4: Students will be able to design strategies to solve problems related to recombinant DNA technology. Acquire an understanding of virus life cycle and host-virus interactions.

NATIONAL INSTITUTE OF TECHNOLOGY DURGAPUR

Even Semester End-term Examination, 2021-22

Course Code:-BTC402

Full Marks: 30

Course Name: Immunology

Time: 90 Minutes

Question Paper No.: NITDGP/BTC402/End Sem

Date of Exam: 26/04/2022

Instructions: Answer any 10 questions from the following.

Question No.	Body of the Question	Marks	Mapped CO
1	Antibody producing hybridoma cells are made with the fusion of and How do you ensure that hybridoma cells are selected in a monoclonal batch production?	1+2	CO4
2	The statements below describe allograft rejection. Which one of them is NOT correct? A. Second set rejection of allografts exhibits memory and specificity B. Allograft rejection can be mediated by lymphocytes C. Second set rejection of allografts occurs in recipients who receive a second transplant from the same donor D. Allograft rejection does not occur if donor and recipient are matched for MHC alleles Explain your answer	1+2	CO2
3is not an example of a "delayed type" hypersensitivity? A. Dermatitis after contact with poison ivy B. Allergy from latex gloves C. hemolytic disease of the newborn D. A positive tuberculin test What kind of hypersensitivity would you classify(your choice) as and why?	1+2	CO2
4	Could you explain the workings of CAR-T therapy?	3	CO5
5	Two serum samples A & B were tested in a serial dilution form of agglutination assay for an infection in the format given alongside. <div style="text-align: center;"> <p>0.5 ml transferred from tube to tube</p> <p>1 ml of antiserum (1:10)</p> <p>0.5 ml saline per tube</p> <p>Control</p> <p>Discard</p> <p>0.5 ml</p> <p>1:20 1:40 1:80 1:160 1:320 1:640 1:1280 1:2560</p> </div> The technician noted that for serum A, the titre was 1:320 and for Serum B, the titre was 1:80. Which of the sample had the highest concentration of the antigen and why?	3	CO3
6	A polyclonal antibody is subject to batch to batch variation – Can you explain why? Would the amount of antigen used play any role in determining polyclonal antibody production? Explain	1+2	CO4

7.	"An indirect immunoassay is often thought to be more sensitive, but a direct immunoassay is more specific". Defend or counter the statement with reason.	3	CO3
8.	How does an immune checkpoint inhibitor work as an anti-cancer treatment?	3	CO5
9.	Match the following : a. Naturally acquired active immunity i) Anti-toxin to human who stepped on a nail. b. Naturally acquired passive immunity ii) Virus vaccine to human. c. Artificially acquired active immunity iii) Antibodies from the milk of a mother. d. Artificially acquired passive immunity iv) Immunity from having measles	3	CO2
10. does not influence the antigenicity of a molecule: a) conformation b) colour c) stability and degradability d) complexity e) molecular weight Can you explain the terms "specificity" and "crossreactivity" as it applies to antigen- antibody interaction?	1+2	CO3
11.	Monoclonal antibodies are one of the most widely used treatment regimens against cancer and other diseases. Humanized antibodies and are the latest in the spectrum. Can humanized antibodies be called chimeras? Are there any advantages of them being humanized?	1+2	CO5
12.	Name any two sites in the body known for its "Immune privilege". Could you explain some mechanism behind their privilege?	1+2	CO2

Course Outcomes

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CO1: To understand the role of the components of the immune system and its classification

CO2: To understand the role of the immune cells and their immunological response in the context of human diseases including infectious diseases, autoimmunity, and cancer.

CO3: To learn the fundamentals and principles of immunological techniques and their application.

CO4: To understand methods of generations of Polyclonal and Monoclonal Antibody and the use of custom made genetically engineered antibodies.

CO5: To solve problems associated with drugs and their toxic response based on the knowledge of immunological response.

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NITDGP/BTECH/Reg/Even/2021-22

NATIONAL INSTITUTE OF TECHNOLOGY DURGAPUR
Even Semester End-term Examination, 2021-22

Course Code: BTC601

Course Name: Bioinformatics

Question Paper No.: NITDGP/BTC601/1

Instructions: Answer all the questions.

Materials to be supplied: Graph paper shall be supplied, if required.

Full Marks: 30

Time: 90 Minutes

Date of Exam: 18/04/2022

Question No.	Body of the Question	Marks	Mapped CO																																																	
1	<p>What is UPGMA method? Construct a Phylogenetic tree through UPGMA method of the following distance matrix. (Show all the steps and the distances from each node).</p> <table><tr><th>Species</th><th>M</th><th>N</th><th>O</th><th>P</th><th>Q</th><th>R</th></tr><tr><td>M</td><td>0</td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>N</td><td>5</td><td>0</td><td></td><td></td><td></td><td></td></tr><tr><td>O</td><td>4</td><td>7</td><td>0</td><td></td><td></td><td></td></tr><tr><td>P</td><td>7</td><td>10</td><td>7</td><td>0</td><td></td><td></td></tr><tr><td>Q</td><td>6</td><td>9</td><td>6</td><td>5</td><td>0</td><td></td></tr><tr><td>R</td><td>8</td><td>11</td><td>8</td><td>9</td><td>8</td><td>0</td></tr></table>	Species	M	N	O	P	Q	R	M	0						N	5	0					O	4	7	0				P	7	10	7	0			Q	6	9	6	5	0		R	8	11	8	9	8	0	2+3	CO1
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R	8	11	8	9	8	0																																														
2	<p>What are the algorithms for performing local and global alignments? Align the following protein sequences through dynamic programming and find the optimal alignment using the following information. (Show all the steps).</p> <p>Seq1: MGTSG Seq2: MGHGTHG Match=2 Mismatch = -1 Gap penalty = -1</p>	2+3	CO1																																																	
3	<p>Differentiate between the following:</p> <ul style="list-style-type: none">a) Phylogram and cladogramb) Structure alignment and sequence alignmentc) Threading and Ab initio predictiond) Distance-matrix methods and discrete data methodse) Rooted and Unrooted phylogenetic trees	5*2=10	CO3																																																	
4	<p>Answer these questions briefly:</p> <ul style="list-style-type: none">a) What is comparative modelling? Name two softwares that perform comparative modelling.b) What is RMSD and why it is used for?c) If two different PDB files "xxxx.pdb" and "yyyy.pdb" containing information of a single protein haemoglobin but at different resolutions 2 Å and 5 Å respectively. Which PDB file would you select and why?d) Explain CASP.e) How many torsional angles are present in the RNA backbone? Name two softwares for RNA secondary structure prediction.	5*2=10	CO3																																																	